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THE DEVELOPMENT OF FLOUNDERS.

BY ALEXANDER AGASSIZ.

THE manner in which the eyes of a flounder become placed on one side of the body has formed a fertile subject for theories. I do not at present propose to discuss the explanations given to account for the facts, but merely to state the results of observations made while studying the development of a number of species of flounders common to our coasts. In the case of five species the passage of the eye from one side to the other is not, as urged by Malm, a simple tendency of the eye of the "blind side" (the side upon which the flounder lies) to turn towards the light and thus carry the surrounding parts of the head with it. The eye placed on the blind side actually travels from its original place (symmetrical with the eye of the opposite side) frontwards and upwards on the blind side, resorbing the tissues in its way, new tissues forming behind; there follows this movement of translation a certain amount of torsion of the whole of the frontal part of the head, which commences only after the eye of the blind side has nearly reached the upper edge of that side, quite a distance in advance of its primitive position. This torsion of course takes place most readily, occurring as it does during a stage when the whole bony fabric of the skull is still cartilaginous, and it is the torsion which ends in bringing the eye to the opposite side. In four of these species of flounders the dorsal fin did not at that young stage extend to the posterior edge of the orbit of the eye coming from the blind side.

In another species, after the eye had thus by the same process of translation and of torsion been brought from the one side to the other, the dorsal fin gradually extended beyond the anterior edge of the orbit of this eye. This young flounder thus soon presented a stage in which the eye from the blind side appeared

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to have passed through the head between the frontal bone and the base of the anterior rays of the dorsal fin. As I had, however, followed the whole development in living specimens, I knew from actual observation that the mode of transfer of the right eye had been identical with that of the preceding species. These observations thus far confirm in the main Malm's explanation of the development of young symmetrical flounders into the well-known older stages. To my great astonishment, therefore, I captured one day a number of flounders (about an inch in length) closely allied to the *Plagusiæ* of Steenstrup, the so-called *Bascania* of Schiödte; they were so perfectly transparent that they seemed the merest film on the bottom of the glass vessel in which they were kept. They were still entirely symmetrical, the eyes well removed from the snout, with a dorsal fin extending almost to the nostril, far in advance of the anterior edge of the orbits of the eyes. They were of course at once set down (from their size) as belonging to a species of flounder in which the eyes probably remained always symmetrical, and I prepared to watch its future development. It was therefore with considerable interest that I noticed, after a few days, that one eye, the right, moved its place somewhat towards the upper part of the body, so that when the young fish was laid on its side, the upper half of the right eye could be plainly seen, through the perfectly transparent body, to project above the left eye. The right eye (as is the case with the eyes of all flounders), being capable of very extensive vertical movements, through an arc of nearly 180°, could thus readily turn to look through the body, above the left eye, and see what was passing on the left side, the right eye being of course useless on its own side as long as the fish lay on its side. I may mention here that this young flounder, until long after the right eye came out on the left side, continued frequently to swim vertically, and that for a considerable length of time. This slight upward tendency of the right eye was continued in connection with a motion of translation towards the anterior part of the head till the eye, when seen through the body from the left side, was entirely clear of the left eye, and was thus placed somewhat in advance and above it, but still entirely in the rear of the base of the dorsal fin extending to the end of the snout. What was my astonishment on the following day, on turning over the young flounder on its left side, to find that the right eye had actually sunk into the tissues of the head, penetrating into the space between the base of the dorsal fin and the frontal bone, to such an

extent that the tissues adjoining the orbit had slowly closed over a part of the eye, leaving only a small elliptical opening, smaller than the pupil, through which the right eye could look when the fish was swimming vertically. While the young flounder lay on its side, the right eye was constantly used in looking through the body, and could evidently see extremely well all that took place on the left side. On the following day the eye had pushed its way still farther through, so that a small opening now appeared opposite it, on the left side, through which the right eye could now see directly, the original opening on the right side being almost entirely closed. Soon after, this new opening on the left increased gradually in size, the right eye pushing its way more and more to the surface and finally looking outward on the left side with as much freedom as the eye originally on the left; the opening of the right side having permanently closed. I have thus in one and the same specimen been able to follow the passage of the eye from the right side to the left through the integuments of the head, between the base of the dorsal fin and the frontal bone.

This observation leads to somewhat different conclusions from those of Steenstrup, who thought he could prove (from an examination of alcoholic specimens) that the eye from the right side passed under the frontal bone. This is evidently not the case here, the eye passing round it, there being only a very slight torsion of the frontal in this young stage. Although at first glance this appears so radically a different method of transfer of the eye from the one described above, yet if the dorsal fin had not extended beyond the posterior edge of the right orbit the process would have been the same, as is readily seen. I hope soon to give full details, with illustrations, of the process of transfer of the eye in its different stages, in a paper I am preparing on the young stages of a few of our bony marine fishes.

But while I have thus been able to trace step by step in living specimens the transfer of the eye from one side to the other, I can give no explanation of the cause which compels flounders to lie on their side. The explanations usually given are not satisfactory. For the great depth of the body, the position of the dorsal and of the ventral fins, the undulating mode of swimming, — all these are so many causes specially adapted to enable them to swim in a vertical position. In fact, they always swim vertically in young stages, when their capacity for vertical support is infinitely less than when they commence to lie on one side.

The rapidity with which the young flounders adapt themselves to the color of the ground upon which they are placed is marvelous. In one of the species the red, yellow, and black pigment cells were brought into the proper combination and prominence with such rapidity that it seemed hardly credible that the same fish could assume such different hues in so short a time. The size and number of these pigment cells, however, readily account for all this.

The young of this transparent flounder do not invariably lie down on the right side; it seems almost a matter of chance which side they choose. Out of fifteen specimens eight lay down on the left and all died without being able to accomplish any part of the transfer of the left eye to the right side, although they lived quite long enough for the other seven, which turned down on the right side, to accomplish the transfer, or nearly so. This incapacity may account for the rarity of sinistral forms of flounders, and *vice versa*. In the other species mentioned above, all the young I have had occasion to keep alive turned down on the proper side for a successful transfer of the eye. I may also mention here that at a certain stage of growth of our *Ctenolabrus* the young show a very decided tendency to lean on the right side. This is even seen in fully grown specimens, in the peculiar slanting position often taken by individuals when they approach an obstacle.

THE FORMER RANGE OF SOME NEW ENGLAND CARNIVOROUS MAMMALS.

BY J. A. ALLEN.

THE geographical range of the larger mammals of New England is well known to have been much more extended formerly than it is at present. Not only have most of the larger species greatly decreased in numbers throughout the more thickly settled portions of the Eastern States, but not a few have become extirpated over regions where they were formerly abundant. This restriction of range and numerical decrease are obviously due to man's agency. Most of the carnivorous species existed in such numbers at the time of the first settlement of the country by Europeans that their presence was a great check upon the rearing of stock, and even a source of danger to human life. Hence, naturally, an exterminating warfare was speedily begun upon them, which was stimulated by the offer of rewards by the

local authorities for their destruction. As I have elsewhere shown,[1] the money paid for the destruction of noxious animals often amounted to a very large draft upon the treasuries of the different towns, in some instances nearly equaling the amount expended for all other purposes. The offer of rewards for their capture proved, as was intended, a great incentive to their destruction, but since many of the carnivorous species yielded also products of a high commercial value, they were likewise eagerly pursued for their furs. In the case of the beaver, the fisher, the sable, and the musk-rat, the demands of the fur trade alone tended to the rapid decrease of a few species not among the legally proscribed. The different species of the deer family were hunted both for their flesh and for their skins. Add to these incentives the pleasures of the chase, which to a large class of sportsmen are a more satisfactory reward than its more tangible products, and the almost incredibly rapid decrease of many species need be no longer a subject of surprise.

The early accounts of the exploration and settlement of New England abound with references to the abundance of the game animals of the country, and furnish reliable evidence of the former more extended range of many of the species and the much greater abundance of all. The woods are often spoken of as filled with wild animals, among which the most numerous were beavers, foxes, wolves, bears, moose, deer, raccoons, and martens; lynxes were common, as was also that "most insidious and deadly foe of human kind, the catamount." The range of the catamount or panther (*Felis concolor*) extends, as is well known, from Northern New England southward not only to the Gulf of Mexico, but throughout the greater part of South America. It long since, however, disappeared from the southern half of New England, as well as from most of the more settled parts of the United States everywhere; the capture during the last ten years of an occasional individual in the Green Mountains and in the forest region of Northern New Hampshire and Maine shows that it still lingers in Northern New England, where it is slowly but surely becoming extirpated. The lynxes (*Lynx Canadensis* and *L. rufus*[2]), doubtless always far more numerous than the pan-

[1] Penn Monthly, October, 1876.

[2] As I have recently pointed out (Bulletin United States Geological and Geographical Survey of the Territories, ii. 222–225, July, 1876), these so-called species, if distinct, are to be distinguished by merely slight differences of coloration, consisting mainly in the grayer tints and less distinct markings of *L.* "*Canadensis*" as compared with *L.* "*rufus*," especially in the tendency to obsoleteness of the transverse

ther, are still taken at long intervals throughout most of Southern New England, where they are, however, nearly exterminated; in the forests of the more northerly parts they are still more or less frequent.

In early days the gray wolf (*Canis lupus*) was abundant everywhere, and as early as 1630 became an outlaw in the Plymouth Colony. In that year the court ordered that any Englishman who killed a wolf should have one penny for each horse and cow, and one farthing for "each sheep and swine," owned in the colony.[1] In 1698 the town of Lynn voted to allow a premium of twenty shillings for every wolf destroyed in the town.[2] Many writers refer to its great destructiveness to sheep and calves, and to its roaming at night in large packs. They also describe it as presenting a great variety of colors, showing that the same diversity of color occurred among the wolves of Southern New England that has been noticed among those of other sections of the country. Thomas Morton, in a work published in 1637,[3] says, "The wolfes are of divers coloures: some sandy coloured: some griselled, and some black. . . . . The skinnes are used by the Salvages, especially the skinne of the black wolfe, which is esteemed a present for a prince there."

It is now many years since the last wolf was seen in New England east of the Connecticut and south of New Hampshire, but as late as the beginning of the present century it was abundant in Southern Maine as well as in Southern Vermont and New Hampshire, and was of rather frequent occurrence in the mountainous portions of Western Massachusetts. None are now found south of Northern Maine and the White Mountains.

The gray fox (*Urocyon Virginianus*) is well known to have formerly ranged much farther northward than it does now. Even within the last thirty to fifty years it has disappeared over considerable areas along the northern border of its habitat. Extending northward formerly to the Great Lakes, it seems now to have nearly disappeared north of the Ohio River. It is also

markings on the inside of the fore legs. *L. "Canadensis"* being a more northern form than *L. "rufus,"* it generally has longer, softer, and fuller pelage, and the pads of the feet are more fully covered; it has consequently the appearance of being larger, but measurements of specimens in the flesh, as well as of a large number of the skulls of each, show the difference to be more apparent than real, and due to the greater length and fullness of the pelage. Hunters and trappers, however, recognize certain characteristic differences of habit, and call the two forms by different names.

[1] Lewis's History of Lynn (edition of 1829), page 37.

[2] Ibid., page 144.

[3] New English Canaan, page 79.

well known to have once inhabited the Atlantic States eastward to Southern New England. Dr. Emmons recorded it as "rare" in Massachusetts in 1840; Audubon and Bachman speak of it as not uncommon in the vicinity of Albany, N. Y., but as rare in New England. It is explicitly described as an animal of Massachusetts by some of the early writers, but I have heard of only one or two instances of its recent capture in this State.

At the southward, particularly in Pennsylvania and Virginia, the gray fox seems to have been the prevailing species at the time of the arrival of Europeans, there being, among the numerous early enumerations of the animals of this region, frequent and explicit allusions to this species, while the red fox is rarely mentioned. Kalm, in speaking of Pennsylvania, says, "The red foxes are very scarce here; they are entirely the same with the European sort. Mr. Bartram and several others assured me that according to the unanimous testimony of the Indians this kind of foxes never was in this country before the Europeans settled it. But of the manner of their coming I have two different accounts. Mr. Bartram and several other people were told by the Indians that these foxes came into America soon after the arrival of the Europeans, after an extraordinary cold winter, when all the sea to the northward was frozen; from thence they would infer that they could perhaps get over to America upon the ice from Greenland or the northern parts of Europe and Asia. But Mr. Evans and some others assured me that the following account was still known by the people. A gentleman of fortune in New England, who had a great inclination for hunting, brought over a great number of foxes from Europe, and let them loose in his territories, that he might be able to indulge his passion for hunting. This is said to have happened almost at the very beginning of New England's being peopled with European inhabitants. These foxes are believed to have so multiplied that all the red foxes in the country were their offspring. At present they are reckoned among the noxious creatures of these parts. . . . . In Pennsylvania, therefore, there is a reward of two shillings for killing an old fox, and of one shilling for killing a young one."[1] Forster, however, in a foot-note to Kalm's work (*loc. cit.*, pages 283, 284) dissents from this theory and believes that they reached America from Asia, and cites the fact of Commodore Behring's meeting with them when he landed on the west coast of America. Professor Baird calls attention to the fact

[1] Kalm's Travels, Forster's Translation, i. 283, 284.

that no remains of the red fox have been found in the Carlisle and other bone caves of Pennsylvania, while those of the gray fox are abundantly represented there. "This," he adds, "would almost give color to the impression somewhat prevalent that the red fox of Eastern America is the descendant of individuals of the European fox imported many years ago and allowed to run wild and overspread the country. The fact of their present abundance and extent of distribution is no barrier to the reception of this idea, as the same has been the case with horses, brought over by the Spaniards after the discovery of America, and set at liberty."[1] In a recent number of *Forest and Stream* (October 5, 1876), Mr. Alexander Hunter quotes Colonel T. B. Thorpe as saying, "The red fox is supposed to have been imported from England to the eastern shore of Maryland, and to have emigrated to Virginia on the ice in the severe winter of 1779, at which time the Chesapeake was frozen over. In 1789 the first red fox that we have any record of was killed in Maryland. In that year there had been a few red foxes turned loose on Long Island."

That the red fox was an abundant species from New York northward, however, as early as the sixteenth century is a fact as well substantiated as that of the existence there of the wolf or beaver. The red fox was seen by Jacques Cartier on the Saguenay River in 1535 and 1536. Its occurrence in great numbers in Newfoundland as early as 1590 to 1620 is repeatedly mentioned by Richard Whitboune and other contemporary explorers. In 1603 Martin Pring found foxes so abundant on an island in latitude 43° that he named it Fox Island. He also speaks of meeting with great numbers on the main-land in latitude 43° 30′. Morton likewise refers to their abundance in Massachusetts prior to 1637. The first settlers of the town of Lynn found them to be annoyingly numerous, and in 1698 voted to pay a reward of two shillings a head for their destruction. Lewis states, in his history of the town, that the town records show that between this date and 1722 the destruction of four hundred and twenty-eight foxes was paid for by the town, all of which were killed in the "Lynn woods and on Nahant."[2] In the enumeration of the peltries exported from Quebec during the single year 1786, 6213 fox skins are mentioned.[3] It is also stated that the records of the Pynchon

[1] Mammals of North America, page 130.

[2] Lewis's History of Lynn, edition of 1829, page 144.

[3] Mass. Hist. Coll., vi. 57.

family show that between the years 1654 and 1674 the Pynchons packed and exported to England from the Connecticut Valley, among other peltries, "large quantities of fox skins."[1] The first settlers of Maine and New Hampshire also found the fox there in great abundance. These various references to the fox in New England also show that its several varieties, as the "black,"[2] "gray," and "cross" foxes, were of frequent occurrence as far south as Massachusetts and New York.

This shows conclusively that while English foxes may have been taken to America and turned loose by the early colonists, the more northerly portions of the Atlantic coast region abounded with this animal long before its reported importation from England, and hence that the theory that the red fox of North America is of recent European origin is wholly unfounded. Were there not direct evidence to the contrary, it is highly improbable that the millions of foxes existing throughout the northern half of the continent, where this animal was found in great abundance wherever the first explorers penetrated, could have originated from the few imported to New England and Maryland in the seventeenth and eighteenth centuries, and thence spread throughout the vast interior, westward to the Pacific and northward to the arctic circle.

The apparent absence of its bones, however, in the bone caves of Pennsylvania, where have been found the semi-fossil remains of nearly all the other existing mammals of that region, together with its known absence or at least great scarcity there when Europeans first settled that State, seems to show conclusively that it has spread considerably southward along the Atlantic coast during the last two hundred years, and that the gray fox has receded before it.

Notwithstanding the constant persecution to which this animal has been subjected, it is still of more or less frequent occurrence throughout New England, and through its consummate cunning has even been able to extend its range over considerable areas since the first settlement of the country.

The early records show that both the fisher (*Mustela Pennanti*) and the marten (*Mustela Americana*) were common inhabitants of not only the whole of New England, but also of the Atlantic States generally, as far southward as Virginia (except-

[1] Temple and Sheldon's History of Northfield, Mass., page 49, foot-note.

[2] In the early records the fisher (*Mustela Pennanti*) is also usually called the "black fox."

ing possibly a narrow belt along the seaboard), and even farther southward along the Alleghanies. None, however, now exist in the United States east of the Mississippi River, south of Northern New England and Northern New York, except at a few points in the Alleghanies. They were occasionally found in Western Massachusetts a generation since, but they probably rarely if ever occur there now. Being eagerly hunted for their furs they soon disappeared before the advancing settlements, and linger only in such wooded regions as are least frequented by man. The mink (*Putorius vison*) and the weasels (*P. erminеus* and *P. vulgaris*) are still generally distributed, but in all the more thickly-settled parts of New England they long since became comparatively infrequent, though still numerous in the northern forests. The otter (*Lutra Canadensis*) and the raccoon (*Procyon lotor*), both formerly abundant, are now everywhere rare in Southern New England, over large portions of which they have become quite extirpated. The wolverine (*Gulo luscus*), now rarely recognized as an animal that was ever found in New England, seems to have been formerly of frequent occurrence in the northern parts of Vermont, New Hampshire, and Maine, and probably once inhabited the highlands of Western Massachusetts. Samuel Williams, writing in 1794, cites it as an inhabitant of the "northern and uncultivated parts" of Vermont,[1] and Hanson says it was formerly found in Maine, while their accompanying descriptions of the animal leave no doubt of the correctness of their identifications.

The black bear (*Ursus Americanus*[2]) is well known to have been of very frequent occurrence throughout not only New England, but the whole of Eastern North America. Still occasionally taken in the Green Mountains even as far south as Northern Connecticut, it is probably wholly extinct east of the Connecticut River south of the White Mountains. Though comparatively frequent in some portions of Northern New England, it is even there much more rare than formerly.

The polar bear (*Ursus maritimus*) seems never to have quite

[1] Natural and Civil History of Vermont, page 87.

[2] A recent reëxamination of the specific relationship of the North American bears, based on the large collection of skulls contained in the National Museum (see Bulletin of the United States Geological and Geographical Survey of the Territories, ii 334–340), has convinced me of the specific distinctness of *U. Americanus* auct. from the *U. arctos* of the Old World, from which latter, however, the *U. horribilis* is distinguishable as a geographical subspecies. The *U. cinnamominus* seems not separable from *U. Americanus* even as a geographical subspecies, and the *U.* "*horriæus*" seems to be similarly undistinguishable from *U. arctos* var. *horribilis*.

reached the New England coast, though its range southward extended much farther than has been generally heretofore recognized, as is unquestionably proven by the following extract from the account of Jacques Cartier's voyage to Newfoundland in 1534. In his account of the "Island of Birds," situated off the coast of Newfoundland, it is stated, "And albeit the sayd island be fourteen leagues from the maine land, notwithstanding beares come swimming thither to eat of the sayd birds, and our men found one there as great as any cow, and as white as any swan, who in their presence leapt into the sea; and upon Whitsunmunday (following our voyage toward the land) we met her by the way, swimming toward land as swiftly as we could saile. So soone as we saw her we pursued her with our boats, and by main strength tooke her, whose flesh was as good to be eaten as the flesh of a calf of two yeares old."[1] Though formerly occurring in considerable numbers along the coast of Labrador, it was probably never common as far south as Newfoundland. According to Dr. Packard[2] the polar bear was occasionally obtained off the coast of Labrador as late as 1864, whither it had apparently drifted on floating ice brought down from the north by the polar current.

The walrus, though its remains are found in a fossil state as far south as South Carolina, probably did not quite reach the New England coast at the time it was first explored by Europeans, though found in large numbers during the middle of the sixteenth century as far south as Sable Island, off Cape Breton, Nova Scotia, and on the Magdalen and other islands in the Gulf of St. Lawrence. The common harbor seal (*Phoca vitulina*) is still more or less common at suitable localities along the New England coast, but its numbers are far less than formerly. Some of the larger seals are also still found along the coast of Maine, but their present southern limits and former range I have been as yet unable satisfactorily to determine.

[1] Hakluyt, Voyages, iii. 250, 251.

[2] Proceedings of the Boston Society of Natural History, x. 370.

ROCK-INSCRIPTIONS OF THE "ANCIENT PUEBLOS" OF COLORADO, UTAH, NEW MEXICO, AND ARIZONA.

BY EDWIN A. BARBER.

THE picture-writings or hieroglyphics of this ancient architectural and agricultural race consisted of *ideographs*, or symbols representing ideas, the object pictured standing for the word to be expressed. So we can see that the method employed for recording events was very imperfect and limited, reaching scarcely beyond the *nouns*, although in some cases they represented *action*, or *verbs*, as in the sketching of men dancing or running. By a careful study of these pictographs and rock-etchings, much relative to these people can be obtained, although many of the symbols are not decipherable. Indeed, it has not been proved that there was any *regularity* or *method* in thus recording events; we know not whether each historian used a peculiar mode of his own for the transmission of ideas, or whether there was a recognized plan which the most educated of the tribe adopted.

I noticed that throughout those ancient inscriptions which are undoubtedly coeval with the ruined buildings and which appear in their vicinity, a common representation was that of an animal closely resembling the domestic goat. This may have been intended for the Rocky Mountain sheep or big-horn, as this animal was plentiful throughout the country four centuries ago, although now it does not occur along the valley of the San Juan River. The horns are represented as long, heavy, and curved backwards. As the goat is not indigenous to America, the flocks or herds of the ancients consisted probably of some of the domesticated wild animals which abounded in that country. The Rocky Mountain goat is in reality an antelope; the big-horn once roamed through Arizona and the mountains of New Mexico. We discover from the accounts of the early Spaniards, who penetrated through this country, that many tribes of Indians which peopled it possessed flocks and herds, though of what nature, we are not informed. Many of the natives clothed themselves in garments made of the hair of the wild sheep, while other tribes wore cotton clothing. Coronado in 1540 wrote of the country of Cibola or Zuñi, "Here are also wild goats, whose heads likewise I have seen." These were probably the Rocky Mountain goats or sheep. Gomara (another Spaniard) remarks in his history relative to this country, about the same time, "There are also great dogs which will fight with a bull, and will carry fifty pounds' weight in sacks

when they go on hunting or when they remove from place to place with their *flocks* and *herds*."

The horse was not known to the natives of America at the time of the conquest, although remains of it occur in a fossil state. Therefore we find no representation of this animal in the ancient inscriptions.

Throughout this entire country the Navajo Indians and the Utes and Pah-utes have covered the walls of bowlders with representations of more recent date, in which the horse figures conspicuously; but these inscriptions can be readily distinguished, by an experienced eye, from those possessing on their very faces the impress of centuries. Indeed, some of them have become entirely effaced, and others are so nearly obliterated that it is only after the most careful study and the most attentive observation that they can be at all distinguished. We do not find in this section many *painted* or *colored* representations; the majority of them are etched or engraved in the rock by the agency of stone implements, such as chisels, awls, etc. In the vicinity of nearly every important congregation of structures these are common on the cliffs and vertical rock-faces. Often they are found in the most inaccessible places and in the neighborhood of the more dangerously located cliff-dwellings. Sometimes they can be descried on a perpendicular wall at a height of hundreds of feet, between the valley below and the summit of the mesa above, but how they could have been cut there we are at a loss to conjecture. They must have been engraved in such cases either from the top of a very long ladder, or by the operator being suspended from above by a long rope of rawhide or sinew; or there may have been, long ago, ledges in the now smooth face of the rock, and steps may have led up to the summit. Such an inaccessible inscription I noticed on a high wall on the north bank of the San Juan River, above the Rio de Chelly. The figures represented three immense centipedes, being several feet each in length, and situated at least two hundred feet above the river. The snake, turtle, and frog are common objects in the hieroglyphics, and these animals were probably held in veneration by the ancients, just as they are now by their descendants in New Mexico and Arizona, being looked upon as the lesser divinities of water. Rude human figures and hands, and feet of birds and animals, such as the eagle or bear, are numerous, but the commonest and most suggestive likeness is that of the human hand. In many of the ruins and frequently on the walls above cliff-

houses are these representations to be seen in great numbers. They have been formed by placing the outspread palms against the rock and spattering mud or paint around them, leaving an accurate and natural-sized outline of the original. These we noticed of all sizes, frequently in pairs, with the thumbs touching. It is impossible to say whether they were intended to convey any particular idea, or whether they were daubed on the walls in idle moments. However, they are the most instructive objects of the ancient picture-writing, and give the ethnologist an important clew to the original people, in the shape, size, and appearance of the hands. We can see that some of them (probably those of children and females) were symmetrical, delicately molded, and beautiful, while many more (undoubtedly those of the adult laborers) were large, rough, and powerful. These occur more particularly in the *Casa del Eco* (a cave-house on the San Juan) and above a collection of cliff ruins near Epsom Creek, in Utah. The illustration (Figure 61) will convey a better idea of them.

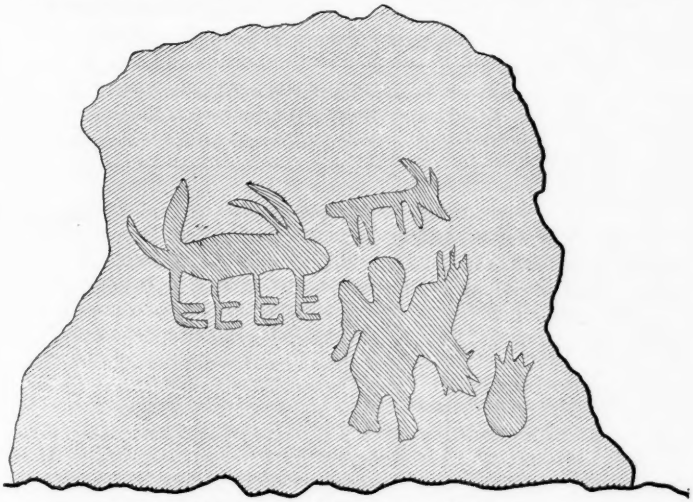
(Fig. 61.) ANCIENT HAND-PRINTS ON THE ROCKS, NEAR EPSOM CREEK, UTAH.

Just to the west of Ute Mountain, on a bowlder of rock near the old Indian trail leading down the McElmo arroyo, in Southwest Colorado, is an ancient inscription representing a man, two deer or elk, and several characters intended for either the feet or the foot-prints of a human being, or of a bear (Figure 62). Now as there are deer and bear on the neighboring mountain, this may be the record of an event, and may possibly be translated thus: A hunter, observing the tracks of a bear, trailed him some distance, and instead of discovering the bear overtook two deer or elk, which he slew. The figures may be intended for either, probably the latter, one full-grown and the other smaller.

There have been no *written* accounts discovered among the remains of the "Ancient Pueblos," [1] nothing but these hieroglyphics, and by the employment of the latter symbols the In-

[1] Mr. J. H. Beadle says of the Zuñians who now occupy a town in New Mexico, "They formerly had the art of writing, but appear to have lost it in their many mutations. They preserve one book, but the last man who could read it died many years ago, and the priests regard it merely as a holy relic. It consists simply of a mass of finely dressed skins, bound on one side with thongs; the leaves are thickly covered with characters and drawings in red, blue, green — squares, diamonds, circles, serpents, eagles, plants, flying monsters, and hideous human heads. One of their *Caciques* says it is the history of their race, and shows that they have moved fourteen times, this being their fifteenth place of settlement."

dian tribes of to-day transmit accounts of their principal events to their children. Battles and unusual incidents of great ceremonies are thus recorded, as, for instance, on the interior of the canvas of a Ute *wick-e-up*, at the White River Agency, in Northwestern Colorado, I observed the elaborate representation of a battle in which the Ute tribe had been engaged against the Arapahoes. There were seven horses which had been captured, beside a bow and quiver of arrows, an elegant red pipe made of the Catlinite from the *Coteau des Prairies* and bound with silver bands, and some furs and blankets, while the captors

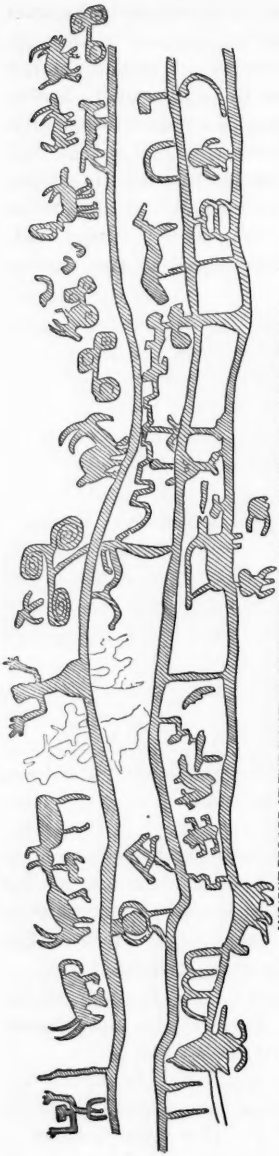


INSCRIPTION NEAR UTE MOUNTAIN, S.W.COLORADO.
(Fig. 62.)

were figured riding behind with scalps and other trophies dangling from their lances or spears. This was explained to me by the artist, one of the head men of his tribe, and the foremost in the skirmish. In another lodge at the same place I noticed the recorded history of a memorable buffalo or bison hunt.

This method of perpetuating incidents has been employed by North American tribes for centuries, but beyond this neither advancement nor improvement has been made.

One of the best preserved and most interesting of ancient inscriptions we copied from the wall of a rock situated beneath some extensive ruins in the valley of the Hovenweep, where it joins the McElmo in Southwestern Colorado. Sheltered by an



(Fig. 63.)

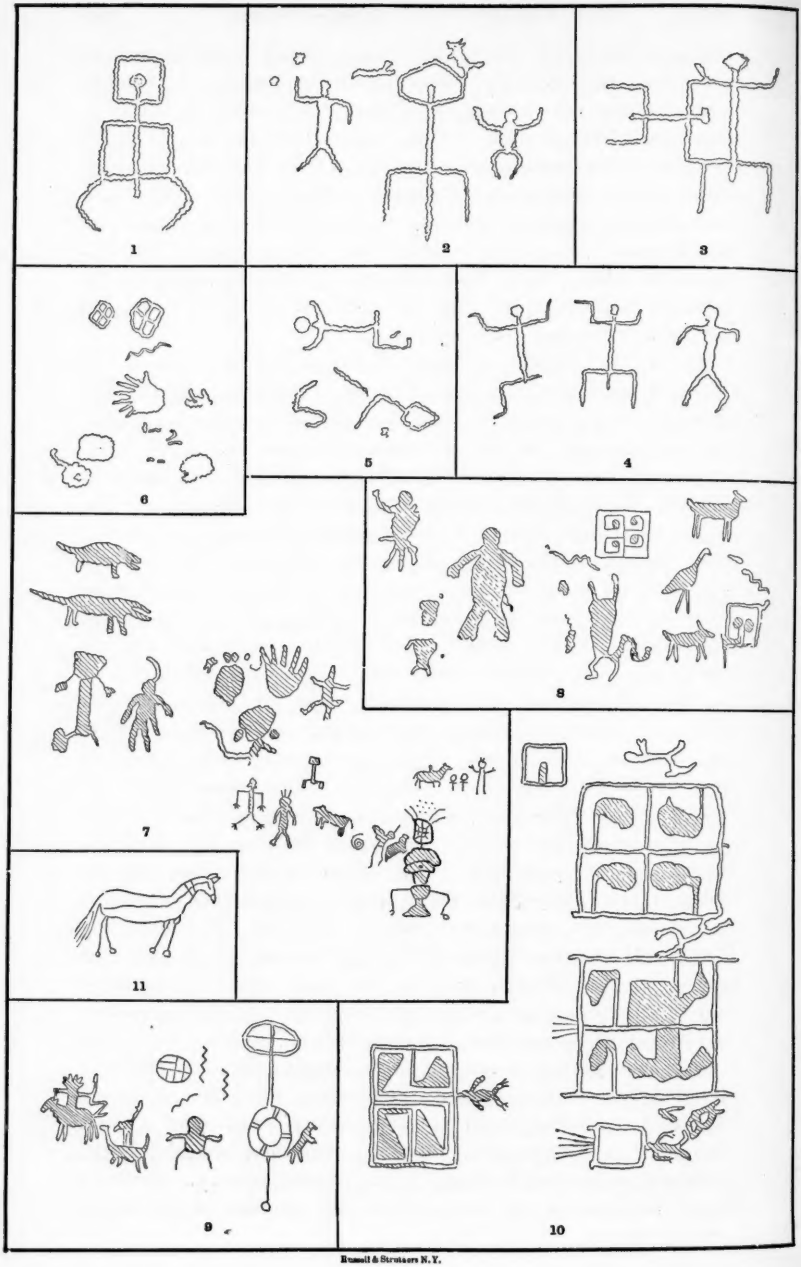
overhanging ledge, the original characters had been tolerably well preserved from the elements, but the wind constantly sifting fine sand against it had rendered the figures and lines in places somewhat obscure. The work had been done with a blunt chisel by pecking off little chips of the sandstone. The figures average a foot in height, and are arranged on three approximately parallel lines, which extend for perhaps fifteen feet. Figure 63 is a copy of the original. Here we see frequently pictured the mountain sheep (?), and we can recognize the snake, tortoise, and a bird flying out of a tree. There are also human beings, more birds, a bear, and numerous undecipherable characters. The legend may have been read along the lines, commencing at the left-hand upper corner, or it may have been perused after the Chinese manner, beginning at the other end.

In the Cañon of the Mancos Mr. W. H. Jackson discovered a simple inscription wherein are figured a bird, a goat (or deer), a man, and several snakes or ornamental designs.

Along the banks of the Gila Lieutenant Emory saw many etchings on the rocks which were probably the work of modern Indians. But "others were of undoubted antiquity, and the signs and symbols intended, doubtless, to commemorate some great event. One stone bore on it what might be taken, with a little stretch of the imagination, for

a mastodon, a horse, a dog, and a man. Their heads are turned to the east, and this may commemorate the passage of the aborigines of the Gila on their way south." It is evident, however, that these etchings were of comparatively recent date, from the presence of the horse, unless the figure was designed for some other animal, which seems probable. The presence of the mastodon is also extremely doubtful, and we must indeed stretch our imaginations in order to believe that this ancient animal was known to these people and pictured in their hieroglyphs, for although their antiquity may be great, they certainly do not date back to the quaternary period.

Mr. W. H. Holmes, in charge of one of the branches of the United States Geological Survey of the Territories, discovered a number of singular inscriptions, some of them evidently of modern workmanship, but many of them of almost undoubted antiquity. Figures 1, 2, and 3, Plate XIII., were copied from the rocks near the Mancos in the vicinity of some of the cliff-houses. The majority of these figures were intended to portray the human form, though in grotesque shapes and attitudes. In Figure 2 may be seen one or two representations of animals, though what they may have been designed for it is impossible to determine. Figures 4, 5, and 6 occur near the others, painted in red and white clay. Mr. Holmes thinks that "these were certainly done by the cliff-builders, and probably while the houses were in process of construction, since the material used is identical with the plaster of the houses. The reproduction is approximately one twelfth the size of the original." The remainder of the figures on this plate and those given on Plate XIV. were seen ten miles below the mouth of the Rio la Plata, on the San Juan River. All of them have been etched in the rocks, and the bodies of the figures have been generally chipped out, sometimes to a depth of a quarter or a half of an inch. In Figure 8 of Plate XIII. we can distinguish several objects, as a bird, a deer, several fanciful designs, and two men with tails. These latter may represent monkeys, although from their size and appearance they resemble more a pair of tailed human beings. In Figure 7 occur two animals resembling huge lizards; they are probably intended for disproportioned sand-lizards, and not alligators. Figure 11 is without doubt a recent Navajo drawing of a horse. Figure 10 is comparatively ancient, somewhat resembling the prevalent patterns to be seen on the ancient pottery. Figure 9 is more modern, as may be seen from the presence of the horse.



Russell & Strousers N.Y.

PLATE XIII.

In Plate XIV., Figure 1 is a procession of animals, the majority representing deer and elk. The inscription is possibly intended to chronicle a great migration of an ancient tribe with their flocks and herds. At *c* is what appears to be a reindeer drawing a sledge which contains two human figures. Might not this be the record of a traditionary migration from the north? Through the procession are scattered men and birds, and two winged figures at *b b* seem to be hovering in the air. At *a* are two long-tailed animals resembling the American panther; they seem to be entering a trap. The whole picture is about one twelfth of the original in size.

Figures 2 and 3 are copies of portions of considerable inscriptions, these being the least obscure. They are evidently very old, and in many places almost obliterated. In Figure 2 can be distinguished several birds at *a a a*, the lower two in all likelihood representing eagles; *b* is an unknown animal, possibly a bear; *c* is a geometrical design for ornamentation; *d* may be a representative of the family of marsupials, and *e* a man. The figures of the etching are so complicated that it is difficult to distinguish many of them. In Figure 3 is a representation of a Rocky Mountain sheep at *a*; *b* resembles either a llama or a female deer; *c* and *d* are distorted images of the human form. There are also prints of birds' feet, and the upper figure appears more like a comet than anything else.

From the preceding remarks we see that the ancients possibly represented several animate objects, which do not occur within the limits of the United States. It would seem, then, that they held communication with other tribes in widely separated sections. The presence of the reindeer makes it appear highly probable either that the people had reached their southern homes from the far north, or that they had at least held intercourse at one time with northern tribes. If we can identify the llama in their inscriptions, we establish the fact that they corresponded with the people of South America. This, however, is a matter of doubt, and we can arrive at no satisfactory conclusion from a careful examination of such rude figures.

The whole subject is enshrouded in an impenetrable obscurity, and all our attempts to pierce it result in conjecture and doubt. That many of the hieroglyphical records are very ancient we cannot deny, yet it is impossible to know where to draw the line of separation between such and those of more modern date. The oldest, and those of undoubted coexistence with the most ancient

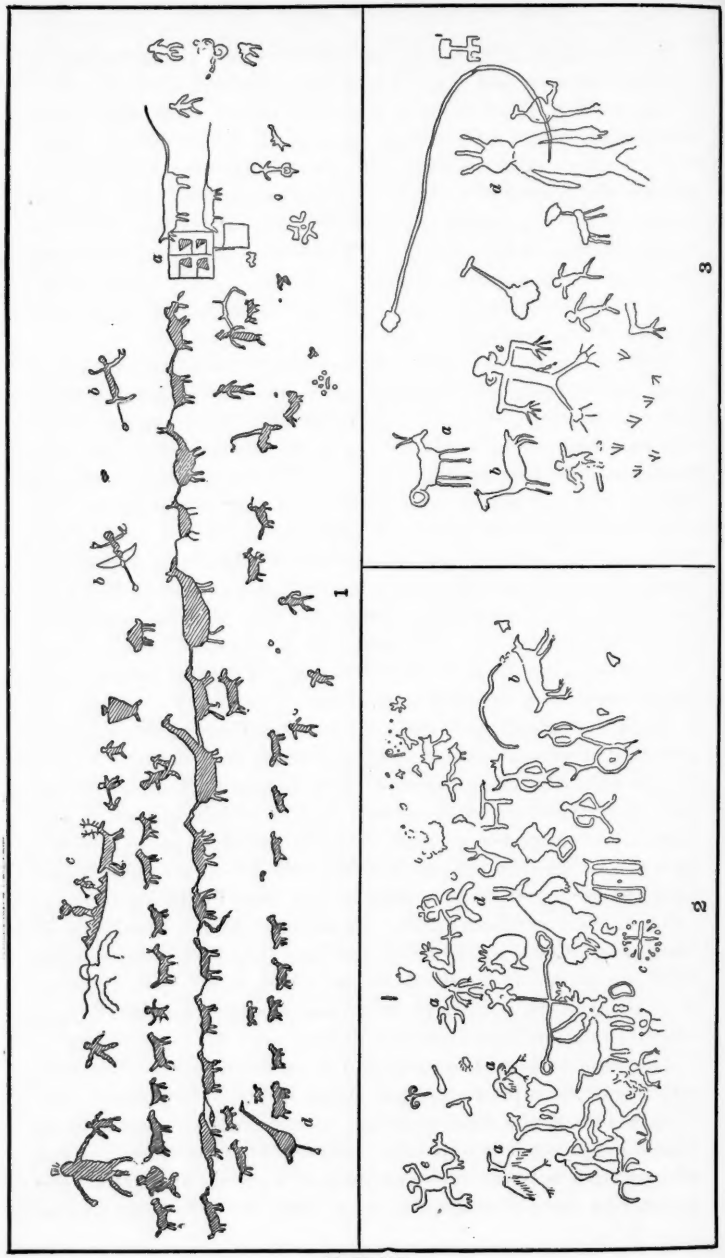


PLATE XIV.

of the ruins, are entirely obliterated by the ravages of centuries. We can simply go back a few hundreds of years and infer that these inscriptions may have been copied from still older ones, which have long since disappeared.

These discoveries are the results of the explorations of several parties of the United States Geological and Geographical Survey of the Territories, in charge of Prof. F. V. Hayden, and Plates XIII. and XIV. have been kindly furnished to me by him for this paper.

MICROSCOPY AT THE INTERNATIONAL EXHIBITION.

BY R. H. WARD, M. D.

IN briefly reviewing the microscopes exhibited at the American Centennial Exhibition, just closing at Philadelphia, it will be convenient to classify them in three more or less natural groups: the Continental, English, and American. All these classes are largely and characteristically represented by the most interesting and in many cases by the most distinguished examples of their kind, affording to microscopical students the best opportunity yet furnished in this country to study and compare the various types and qualities of tools available for their work.

It will be expedient to mention first, however, a few isolated and unclassifiable exhibits which are still of sufficient interest to demand a passing notice, such as a very small upright educational microscope of no well-marked character, from Switzerland; a small instrument from Tokio, Japan, which is evidently an early if not a first attempt, and a not unsuccessful one, though of unpretending form and crude workmanship, to imitate the instruments in vogue in this country a score of years ago; and a couple of large, clumsy instruments from Canada, one of them from Montreal and the other in the educational exhibit from Toronto, of which it can only be hoped that they do not fairly represent the science and art of our Canadian friends, since they are wholly devoid of any evidence of the spirit of that progress which has so fully and so fortunately changed the microscope from a piece of furniture to a tool for scientific work, and are in fact excellent illustrations of what a microscope ought not to be for educational purposes.

The continental microscopes are chiefly represented by the exhibit of Nachet, of Paris, whose compact, ingenious, elaborate, and thoroughly built instruments are present in large numbers and

great variety, constituting, with one exception perhaps, the most exhaustive exhibit in our department. Besides the familiar Nachet stands, large and small, monocular and binocular, for one observer and for more than one, and of course the inverted microscope of Prof. J. L. Smith, which the manufacturer never should have allowed to pass as his own, there are dainty pocket microscopes in cases of wood or nickel-plated metal, clinical, tank, and dissecting microscopes, and a few accessories, which, though not absolute novelties, are at least not usually seen on sale in this country. The most conspicuous and possibly the most worthless article in this exhibit is a huge inverted microscope, as big as a small stovepipe, in which great amplification is gained by means of the great distance between the ocular and the objective.

Bardou and Son of Paris also exhibit, in connection with a large display of telescopes and other optical goods, one large instrument of the French style, having no important characteristics, and a few inferior instruments.

Austria is represented by S. Plossl & Co., of Vienna, whose little case contains a compact histological microscope of excellent design and attractive appearance. In place of a rack, a pair of arms attaches the body to the milled heads near their circumference, changing the rotary to a plunging motion, as if the driving wheel of a steam-engine moved the piston rod, and giving a very delicate adjustment just as the body approaches a state of rest. Accompanying this instrument is a clinical one, of the German style and far simpler than the French, English, or American forms.

The handsomest case of instruments in the English department, and indeed in the whole exhibition, is that contributed by the Ross house, of London. Less than this could hardly be true of a finely finished show-case well filled with their almost unequaled workmanship. With the exception of the new Wenham adaptation of the Jackson form of stand, and the series of new Wenham objectives which are understood to have been entered for competition and then permanently removed from the exhibition and the country, there is but little in the exhibit that would be called novel, most of the forms seen being the familiar and standard styles of several years past. No better commendation of the new stands, whose beauty is universally conceded, could be desired than is furnished by the old style Ross stands exhibited by their side. Notwithstanding the solid workmanship of the latter, and the care with which they were doubtless

packed for transportation, the transverse bar which joins the body to the rack has in nearly every case given way under some unfortunate jar and become hopelessly though not conspicuously deformed. The untimely removal of the set of comparatively unfamiliar objectives from the exhibition could not have been an intentional breach of courtesy or propriety, but was certainly an unfortunate mistake on the part of both the proprietors who desired and the officials who permitted it.

R. and J. Beck's exhibit is perhaps the most complete in the exhibition, but is so badly displayed as to present a scarcely attractive appearance. The large number of standard forms and the numerous and convenient accessories made by this firm have been so extensively exhibited and sold in this country that their peculiarities are well known. The chief novelties are a much-needed addition of centring and rotating adjustments to the substage, and a showy introduction of aluminium mountings in some of the stands.

Henry Crouch, of London, also exhibits a full series of instruments characterized by a greatly improved quality of moderate-priced work, a class of work for which there is an increasing appreciation and a growing demand. His best stands of medium size lack scarcely any advantage as compared with far more clumsy and costly first-class stands. His variety of accessories is large and well selected, showing an earnest endeavor to adopt the best novelties from every source. His manufacture of a small histological instrument, with short body, low stage, and horse-shoe base, after the Continental method, is one more evidence of the growing favor with which such instruments are regarded in England and America, especially as it is sold at a price greatly disproportionate to its size and elegance.

Of Negretti and Zambra it need only be said that along with other goods they display a small variety of microscopes, of which but one, the largest, is notable, and that merely for its bigness. It belongs to the furniture style of instruments, and so does its large case of accessories. Precisely the same words may be applied, except as to numbers, to the two huge instruments of J. H. Dallmeyer, the smaller of which is, in the writer's judgment, too large for any known use.

The class of American instruments, though not as distinct a group as the other two, is mentioned separately for local reasons as well as on account of some peculiarities which its members have in common. Certainly first among these is the exhibit of

Joseph Zentmayer, of Philadelphia, who offers the most elaborate and elegant instruments as well as the largest variety of different forms. His ingenious contrivances and excellent brass-work are too familiar to need description. He shows the large American, intermediate, hospital, and clinical stands, and the new student's, introduced a few years ago to meet the demand for histological instruments; also a material modification of the American, introduced this summer and known as the model, having the three new features of a fine adjustment by a long slide close behind the rack and moved by a screw and lever nearly in the Ross position, an interchangeable stage which can be almost instantly removed and replaced by an extremely thin diatom stage, and a bar, which carries the substage and mirror, hinged at the level of the plane of the stage so as to enable the illuminating apparatus to revolve with facility and in an easily measured position around the object as a centre. He also exhibits a new pocket microscope of neat and apparently serviceable construction.

T. H. McAllister's case, in the photographic building, exhibits his two or three grades of instruments, with chain movements, thin stages, and often iron bases, built with a view to both economy and excellence; and also a new-model physician's microscope, which is literally a charming little instrument, very portable and handsome, and combining with most of the excellencies of the maker's former work the Zentmayer glass sliding stage and the diaphragm in the stage close to the object. The objectives furnished with it vary from fair to the best, according to the pecuniary views of the purchaser. The accessories are of the usual forms.

Bausch and Lomb, of Rochester, who have lately added to the province of the Vulcanite Optical Instrument Company, of that city, a microscopical department, under charge of E. Gundlach, formerly of Germany and late of Hackensack, N. J., exhibit a large series of entirely new designs. These are all of excellent workmanship, though of low or medium grade as to size, complexity, and cost. By simplifying the designs, introducing vulcanite into the mountings where it can be done to advantage, and introducing the business principle of attempting to create a large demand by production at a very low cost, the experiment of offering good instruments at a very low rate is being tried on a scale and with facilities unprecedented in this country. The special peculiarities of these stands, aside from the vulcanite mountings, are the hinging of the substage bar at the level of

the object, contesting in this respect the priority with Zentmayer's new stand; a new object carrier, which with some improvements may be convenient; a new fine adjustment, by means of a screw acting on the body, which is supported at the end of two parallel horizontal springs, which allow a peculiarly smooth motion practically incapable of deterioration from wear or any other probable cause; and a coarse adjustment, consisting of a slide at the upper part of its course, and, below, a rapid screw which prevents pushing the body suddenly through the slide, and, without interfering with a prompt adjustment of low powers by sliding, gives a delicate adjustment for higher powers by screwing. This method is evidently a modification of Wales' oblique slot.

George Wales' new student's microscope is exhibited by the Stevens Institute of Technology. This is indeed an educational microscope and not a burlesque on the claim of the instrument to educational value. It is a small and compact stand, of the continental style, with horse-shoe base and low stage, of most substantial workmanship, adopting the Zentmayer glass stage, and introducing an original coarse adjustment by means of a sliding tube with the addition of a pin moving in an oblique slot and giving a rapid and very steady and safe adjustment by means of a screwing movement, and an iris diaphragm capable of being used after the continental plan close to the object slide, consisting of a thin split tube whose blades are overlapped and gradually closed by being screwed up into a dome-shaped cavity in the bottom of the stage plate. The instrument is furnished with Wales' excellent lenses.

James W. Queen & Co. exhibit their instruments, which are of the English type, reduced and adapted to the student's microscope grade, and aim rather to combine well-known excellencies into a good and popular instrument, than to introduce novelties of construction.

The instruments by W. Y. McAllister, in the Pennsylvania State Educational Exhibit, do not seem to suggest any of the progress of recent years.

A set of William Wales' exquisite lenses was exhibited by Mr. Zentmayer, but was unfortunately allowed to be prematurely removed from the case.

Several makers are conspicuous by their absence. All visitors to this department would have been glad to see Hartnack, and Powell, and Lealand, and the German makers, well represented;

and many felt disappointed at the absence of Spencer, of Tolles, and of Grunow, having very reasonably expected that such prominent American makers would from motives of fitness and courtesy, if not of interest, contribute their share to the completeness of the International Exhibition. It would have been peculiarly appropriate, in view of their undisputed excellence and their high claims, that the new duplex front objectives of Tolles should have been placed in comparison with the world's other lenses, while the unhandsome insinuation which is being extensively printed in advertisements, that they are not at the exhibition because they would not be properly examined there, must have been authorized without serious thought by the persons responsible for it. It is well known that President F. A. P. Barnard, who was associated with such judges in this group as Profs. Joseph Henry, J. E. Hilgard, and others scarcely less distinguished, gave his personal attention to the examination of the exhibits in this department.

Among the objects, other than microscopes, of special interest to microscopists, may be classed the double-stained vegetable preparations by Dr. Beatty, the large series of fine mounted objects by W. H. Walmsley, and the far from equal set of imported objects, both exhibited by James W. Queen & Co., and the more limited series of pathological specimens, by Dr. H. N. Krasinski, in the Russian department; the already famous machine for micro-ruling on glass, by Professor Rogers; the hitherto unequaled photo-micrographs, by Dr. J. J. Woodward, exhibited by the Army Medical Museum, and the good though less pretending attempts in the same direction, by Dr. Carl Seiler, in the photographic building; and the large, interesting, and carefully prepared series of minute fungi, with tinted drawings of the same, contributed by Mr. Thomas Taylor to the exhibit of the department of agriculture in that most creditable portion of the whole exhibition, the United States Government Building.

BASTIAN AND PASTEUR ON SPONTANEOUS GENERATION.

BY HENRY J. SLACK.

IN the number of *Comptes rendus* for July 10, 1876, is a paper by Dr. Bastian, On the Influence of Physico-Chemical Forces in the Phenomenon of Fermentation, intended to demonstrate, in opposition to the theory of atmospheric germs, that certain

organic liquids contain complex chemical bodies which are capable of organization, and form different kinds of bacteria.

In support of these notions he recites experiments on urine caused to boil and screened from the influence of atmospheric germs. To determine the production of bacteria in this urine he introduced potash and oxygen, and subjected it to 122° F. He states that in numerous trials, urine previously rendered sterile and heated as just stated gave rise to bacteria. He found that a temperature of 122° F., though not generally considered favorable to fermentation, was so to the development of bacteria in urine and some other organic liquids.

In the autumn of 1875, he says, he found that urine, normal and acid, rendered sterile by ebullition, became fertile in two or three days when exactly saturated by potash, without other contamination, and after being exposed to an elevated temperature. He further states that he took the most minute precautions to avoid the influence of germs that might have been in the potash or on the walls of the vessels employed, as well as those which the air might carry.

He also states, with regard to the influence of oxygen, that urine rendered sterile, neutralized by potash, and subjected to electric action through platinum wires, gave remarkable results, fermenting rapidly at 122°, and becoming filled with bacteria in from seven to twelve hours. He considers that these experiments overthrow the atmospheric-germ theory, and cites Tyndall to the effect that bacteria germs are destroyed by a temperature of 212° maintained for a minute or two, as was the case with the fluids he used.

In *Comptes rendus* for July 17th, M. Pasteur makes a very polite reply, tinged with a little irony, in the remark that the heterogenists are more fortunate than the inventors of perpetual motion, in the lengthy attention they have received from scientific bodies. In the domain of mathematical sciences it is, he says, possible to demonstrate that certain propositions cannot be true, but natural sciences are less able to predict results. The mathematician may disdain to cast his eye upon an essay which has for its object squaring the circle, or perpetual motion; but the question of spontaneous generation excites public opinion, because it is impossible in the actual state of science to prove *a priori* that no manifestation of life can take place by a jump, without the previous existence of a similar life.

When any observer announces that he has discovered the con-

ditions capable of causing the spontaneous origin of life, he is sure of the prompt adhesion of the systematic supporters of his doctrine, and of raising a doubt in the minds of others, who have acquired only a superficial knowledge of the subject. This is the more the case when an author, like Dr. Bastian, occupies an important position, has literary and dialectic talent, and brings forward conscientious researches.

During the twenty years he has worked at this question, M. Pas teur says he has not been able to discover any life not preceded by a similar life. The consequences of such a discovery would be incalculable. Natural sciences in general, medicine and philosophy in particular, would receive an impulse of which no one could foresee the consequences, and if any one succeeds in reaching such a result, he would welcome the happy investigator on his operations being proved. At present his attitude is one of defiance, as he has so often shown how readily able men make mistakes in this difficult art of experimentation, and what danger is connected with the interpretation of facts.

Let us see, he exclaims, whether Dr. Bastian has known how to escape these two rocks. He then cites the title of Dr. Bastian's paper and his chief remarks, and adds that he hastens to declare that the experiments described would usually give the results that are stated, and that he need not have operated at a temperature of 50° C., as at 25° or 30°, and even lower, boiled urine rendered alkaline by potash in a pure atmosphere becomes filled with bacteria and other organisms." If Tyndall, as Dr. Bastian says, thought this was not so, it must have been through forgetfulness. Dr. Bastian cannot be unaware that the experiments he has just communicated to the academy, or at least experiments of the same kind, were made by me, and published in a memoir in 1862, entitled On Organic Corpuscles which exist in the Atmosphere: an Examination of the Doctrine of Spontaneous Generation. I demonstrated in this paper (pages 58, 66) that acid liquids which always become sterile by a few minutes' exposure to 100° C. are made fecund if we communicate to them a slight alkalinity. The novelty introduced by Dr. Bastian in having recourse to a temperature of 50° C. is only apparent, since this condition is superfluous. There is, then, between us only a difference in the interpretation of facts common to both. Dr. Bastian says these facts prove spontaneous generation, and I reply, Not at all; they only demonstrate that certain germs of inferior organisms resist a temperature of 100° C. in neutral and

slightly alkaline solutions, doubtless because under such conditions their envelopes are not penetrated by the water, and that they are so if the medium in which they are heated is slightly acid. In reference to this I will recall that the workmen of Rouen, as M. Pouchet informed us, noticed that certain seeds attached to wool coming from Brazil germinated after four hours' exposure to boiling water, and M. Pouchet proved that when the germination occurred after such treatment the grains had preserved their natural size, their hard, horny envelope not having been penetrated by water or steam; when the contrary was the case, germination was impossible. With regard to germs disseminated in atmospheric dust, I proved that they perished in an acid medium at 100° C., but they remain fertile if the medium is alkaline. (See page 65 of my paper.)

"If Dr. Bastian wishes to assure himself of his errors of interpretation, he can easily do it. He obtains bacteria by saturating boiled urine with potash. I simply suggest that instead of employing an aqueous solution of potash, he should drop into the urine solid potash after making it red-hot, or even only to 110° C. His experiment will then never succeed; that is, he will obtain no formation of bacteria in urine exposed to 30°, 40°, or 50° C. The conclusion he has drawn from our common experiments is thus inadmissible, for it would be absurd to pretend that the *primum movens* of life is in melted caustic potash. Such is the way of obtaining a decisive result. In one word, I only ask Dr. Bastian to eliminate the bacteria germs which were contained in the aqueous solution of potash he employs. If Dr. Bastian finds it difficult from the apparatus he uses, and does not describe, to bring the potash to a red heat previous to cooling it and dropping it as a solid into the urine, let him, instead of heating it to 100° C., heat it to 110° C., and he will then find sterility if he operates with vigorous accuracy. If he still preserves his doubts, let him suppress the preliminary condition of causing the urine to boil; for it is a remarkable fact that urine in its absolutely normal state as it leaves the bladder of a healthy man remains sterile if a certain quantity of potash is dropped into it, with the precautions I have described in chapter iii. of my recent work on beer, to avoid contact with atmospheric germs. Dr. Bastian conscientiously seeks the truth, and no alternative conclusion is possible. I entertain the firm hope that he will abandon his belief in spontaneous generation and in the proofs he supposes he has adduced."

M. Pasteur at the close of his paper stated verbally that, although the urine of a healthy man contains no extraneous germs of organic bodies, in most cases it comes into contact with such germs at the moment of its emission at the extremity of the urethral canal, or in the surrounding air. He also described the very simple apparatus he employed to repeat Dr. Bastian's experiments with decisive results. It is a pity that no details of this are given in *Comptes rendus.*

Dr. Bastian's reply to Pasteur's criticism, and the latter's rejoinder, will be found in *Comptes rendus* for July 31st and August 7th; they add nothing to the preceding. — *Monthly Microscopical Journal, October.*

THE DESTRUCTION OF BIRDS BY TELEGRAPH WIRE.

BY DR. ELLIOTT COUES, U. S. A.

THIS is a subject which has already attracted deserved attention in Europe, and I believe that much has been said about it, particularly by German writers. But in this country the facts in the case seem to have been to a great degree overlooked, or at any rate insufficiently set forth in the random notices which, like the accounts of the mortality caused by light-houses, have occasionally appeared. Yet the matter is one of much interest, as I shall here take opportunity to note. Few persons, probably, even among ornithologists, realize what an enormous number of birds are killed by flying against these wires, which now form a murderous net-work over the greater part of the country. Until recently, I had myself no adequate idea of the destruction that is so quietly, insidiously, and uninterruptedly accomplished. My observations do not enable me to form even an approximate estimate of the annual mortality, and I suppose we shall never possess accurate data; but I am satisfied that *many hundred thousand* birds are yearly killed by the telegraph. The evidence I shall present may be considered sufficient to bear out a seemingly extravagant statement.

I recently had occasion to travel on horseback from Denver, Colorado, to Cheyenne, Wyoming, a distance of one hundred and ten miles, by the road which, for a considerable part of the way, coincided with the line of the telegraph. It was over rolling prairie, crossed by a few affluents of the South Platte, along the eastern base of the Rocky Mountains. The most abundant birds of this stretch of country, at the time (October), were horned

larks (*Eremophila*), flocks of which were almost continually in sight; and the next most characteristic species was Maccown's bunting (*Plectrophanes Maccownii*). Almost immediately upon riding by the telegraph wire, I noticed a dead lark; and as I passed several more in quick succession, my attention was aroused. The position of the dead birds enabled me to trace cause and effect, before I actually witnessed a case of the killing. The bodies lay in every instance nearly or directly beneath the wire. A crippled bird was occasionally seen fluttering along the road. Becoming interested in the matter, I began to count, and desisted only after actually counting *a hundred* in the course of one hour's leisurely riding — representing perhaps a distance of three miles. Nor was it long before I saw birds strike the wire, and fall stunned to the ground; three such cases were witnessed during the hour. One bird had its wing broken; another was picked up dying in convulsions from the force of the blow. The eyeballs of several dead ones I examined were started from their sockets, and the feathers of the forehead were torn off, indicating a violent blow upon the head; but in most cases there was left no outward mark of the fatal internal injury. Along some particular stretches of wire where, for whatever reason, birds had congregated, the dead ones averaged at least one to every interval between the poles; sometimes two or three lay together, showing where a flock had passed by, and been decimated. The great majority of the birds destroyed consisted of larks; I noticed perhaps half a dozen buntings, one meadow starling (*Sturnella magna neglecta*), and one green-winged teal (*Querquedula Carolinensis*). The proportion of larks was probably due in the main simply to their greater abundance; but I presume that their singularly wayward, impulsive flight may have increased the risk of striking the wires. They were the only birds I saw knocked down; and I noticed, or fancied I noticed, some hesitation and confusion in their flight when the flocks crossed the line of wire.

From these facts, which I simply narrate, one may attempt to estimate, if he wishes, the extent of the destruction which, as I have already said, goes on incessantly. Given, one hundred dead birds to three miles of wire, all killed, perhaps, within a week; or, given three birds seen to strike and fall in an hour; how many are annually killed by the telegraph wires of the United States? I should be sorry to suppose, however, that the rate of destruction I witnessed is not at or near the maximum;

for I have seldom seen more birds to the acre than during the day to which I particularly refer, and never under circumstances more likely to result in the disaster of which I speak.

Usually, a remedy has been or may be provided for any unnecessary or undesirable destruction of birds; but there seems to be none in this instance. Since we cannot conveniently abolish the telegraph, we must be content with fewer birds. The only moral I can discern is that larks must not fly against telegraph wires.

RECENT LITERATURE.

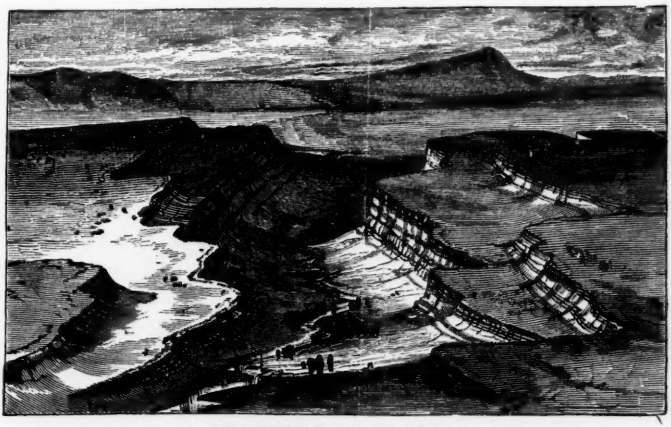
POWELL'S EXPLORATION OF THE COLORADO RIVER.[1] SECOND NOTICE. — Our notice of the second part of this admirable report has been long deferred, but the portion on the structural geology of the region possesses additional interest on account of the publication of Major Powell's report on the geology of the Uinta Mountains, among which one branch of the Colorado, the Green River, takes its rise. As a contribution to the theory of formation of mountains the report is one of special interest. The Rocky Mountains, our author shows, have been carved out by rains and running water from a great block of sedimentary rocks which suffered erosion from the time of its first appearance above the sea. The peculiar form of the mountains is due largely to the soft nature of the rocks and the dryness of the climate. "Though little rain falls, that which does is employed in erosion to an extent difficult to appreciate by one who has only studied the action of water in degrading the land in a region where grasses, shrubs, and trees bear the brunt of the storm. A little shower falls, and the water gathers rapidly into streams and plunges headlong down the steep slopes, bearing with it loads of sand, and for a few minutes, or a few hours, the district is traversed by brooks, and creeks, and rivers of mud. . . . . When a great fold emerges from the sea, or rises above its base level of erosion, the axis appears above the water (or base level) first, and is immediately attacked by the rains, and its sands are borne off to form new deposits." Thus the mountains have never perhaps been higher above the level of the sea than at present; for example, the "Uinta Mountains were not thrust up as peaks, but were carved from a vast, rounded block left by a retiring sea, or uplifted from the depths of the ocean, and their present forms are due to erosion!"

As to the drainage of this plateau Mr. Powell concludes "that the present drainage was established in rocks now carried away from the higher regions, but [with remnants] still seen to be turned up against the flanks of most of the ranges." Thus the present river valleys in

[1] *Exploration of the Colorado River of the West and its Tributaries.* Explored in 1869, 1870, 1871, and 1872, under the Direction of the Secretary of the Smithsonian Institution. Washington. 1875. 4to, pp. 291. With Map and Plates.

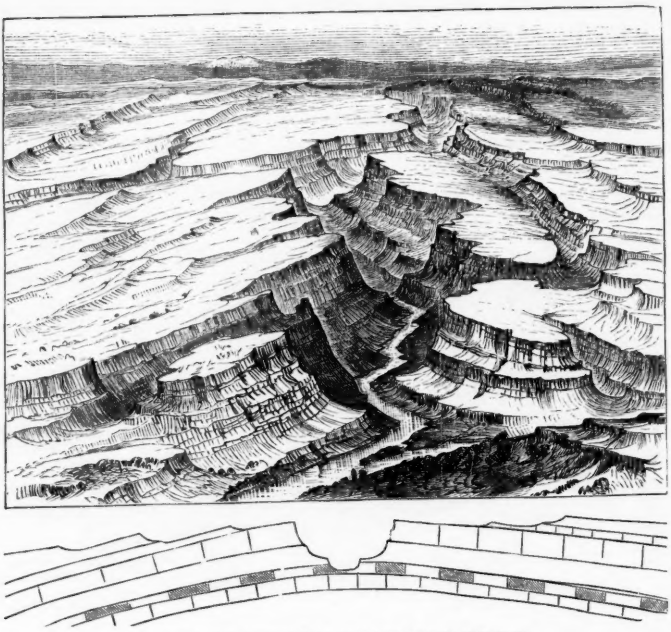
some cases are of great geological antiquity. The relation of the present river valleys to folds and faults is discussed at length. The author finds that the relation of the direction of the streams to the dip of the rocks

(Fig. 64.) A DIACLINAL VALLEY.

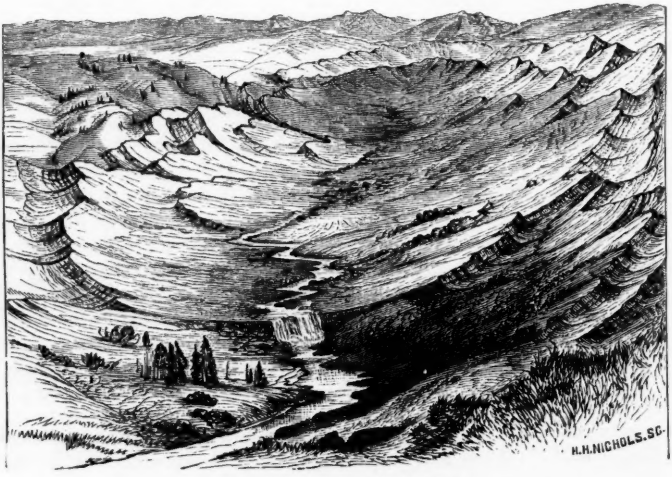


(Fig. 65.) A CATACLINAL VALLEY.

is very complex. He divides the valleys into two orders, transverse and longitudinal. Of the first order three varieties are noticed: *diaclinal* (Figure 64), those which pass through a fold; *cataclinal* (Figure 65),



(Fig. 66.) AN ANTICLINAL VALLEY, WITH SECTION.



(Fig. 67.) A SYNCLINAL VALLEY.

valleys that run in the direction of the dip; *anaclinal*, valleys that run against the dip of the beds. Of the second order there are *anticlinal* valleys (Figure 66), which follow anticlinal axes; *synclinal* valleys (Figure 67), which follow synclinal axes; and *monoclinal* valleys, which run in the direction of the strike between the axes of the fold — one side of the valley formed of the summits of the beds, the other composed of the cut edges of the formation. This classification rests solely, the author adds, on typical examples, one form often running into another.

One who is quite ignorant of geology will find the report exceedingly interesting, while the professional geologist, in whose hands the volume has now been for over a year, has doubtless profited by its perusal.

DAVIES' PREPARATION AND MOUNTING OF MICROSCOPIC OBJECTS.[1] — As a brief and compact manual of the art of preparing and mounting microscopic objects we always supposed that the present one was probably the best. The second edition is a still more useful book, and has been specially adapted by the editor for the use of medical students and young practitioners. For general use, however, we can recommend it as a cheap and reliable book.

HUXLEY AND MARTIN'S BIOLOGY.[2] — A notice, by a most competent critic, of the first edition of this excellent manual appeared in the April number of the NATURALIST. This second edition is issued at a lower price, and contains a number of corrections and alterations, the pages having been entirely reset.

JORDAN'S MANUAL OF THE VERTEBRATES OF THE NORTHERN UNITED STATES.[3] — To those desirous of a cheap manual for the ready identification of our land and fresh-water vertebrates, we should unhesitatingly recommend this book as well compiled and convenient, while the price makes it generally accessible. The characters of the classes and orders are much abbreviated, and the generic characters are confined to a key, "while for specific characters, only such points have been generally retained as are distinctive as well as descriptive." The classification is based on that of recent authors, and no important innovations seem to have been suggested by the author.

In order to test the part related to reptiles and batrachians we have identified several species, before unknown to us, with ease and certainty. The objection to such books as this is that the brief and condensed descriptions are apt to be unsatisfactory in critical cases, but as

[1] *The Preparation and Mounting of Microscopic Objects.* By THOMAS DAVIES. Second Edition, greatly enlarged. Edited by J. MATHEWS, M. D. New York: G. P., Putnam's Sons. 1876. 12mo, pp. 214. $1.25.

[2] *A Course of Practical Instruction in Elementary Biology.* By T. H. HUXLEY, assisted by H. N. MARTIN. Second Edition, revised. London and New York: Macmillan & Co. 1876. $2.00.

[3] *Manual of the Vertebrates of the Northern United States.* Including the District east of the Mississippi River, and north of North Carolina and Tennessee, exclusive of Marine Species. By DAVID STARR JORDAN, M. S., M. D. Chicago: Jansen, McClurg, & Co. 1876. 12mo, pp. 342. $2.00.

the author distinctly states that the manual is designed for "collectors and students who are not specialists," we do not see but that the object has been gained, and the plan very well carried out.

RECENT BOOKS AND PAMPHLETS. — Manuscript Notes from my Journal; or, Illustrations of Insects, Native and Foreign. Order Hemiptera, Suborder Heteroptera, or Plant-Bugs. By Townsend Glover. Washington. 1876. 4to, 10 Plates, pp. 132.

Report of Explorations across the Great Basin of the Territory of Utah for a Direct Wagon-Route from Camp Floyd to Genoa, in Carson Valley, in 1859. By Capt. J. H. Simpson, Corps of Topographical Engineers, U. S. A. Washington. 1876. 4to, pp. 518. With Map and Plates.

Report of the Exploring Expedition from Santa Fé, New Mexico, to the Junction of the Grand and Green Rivers of the Great Colorado of the West, in 1859, under the Command of Capt. J. N. Macomb. With Geological Report, by Prof. J. S. Newberry. U. S. Engineer Department. Washington, D. C. 1876. 4to, pp. 148. With Maps and Plates.

Geological Survey of Michigan, Lower Peninsula. Palæontology. Fossil Corals. By Dr. C. Rominger, State Geologist. (Advance Copy, unrevised by the Author.) New York: Julius Bien. 1876. 4to, pp. 132. With 10 Plates.

Le Helicopsyche in Italia. Lettera agli Entomologi Italiani di Carlo de Siebold. 8vo, pp. 10.

Report on the Geological Map of Massachusetts, prepared by W. O. Crosby, Prof. Alpheus Hyatt in Charge. Under the Direction of the Massachusetts Commission to the Centennial Exposition. Boston. 1876. 8vo, pp. 52.

Insects Injurious to the Potato and Apple. By Prof. G. H. Perkins, Ph. D. (From Third Report of State Board of Agriculture.) Rutland, Vt. 1876. 8vo, pp. 46.

Concerning the Fishes of the Ichthyologia Ohiensis. By David S. Jordan, M. S., M. D. (From the Bulletin of the Buffalo Society of Natural Sciences.) Buffalo. 1876. 8vo, pp. 7.

Hydrographic Sketch of Lake Titicaca. By Alexander Agassiz. (Reprinted from the Proceedings of the American Academy of Arts and Sciences, xi. 1876.) 8vo, pp. 9.

Exploration of Lake Titicaca. By Alexander Agassiz and S. W. Garman. III. List of Mammals and Birds. By J. A. Allen, with Field Notes by Mr. Garman. IV. Crustacea. By Walter Faxon. (Bulletin of the Museum of Comparative Zoölogy, iii. nos. 15 and 16.) July, 1876. 8vo, pp. 26.

On the Development of the Crustacean Embryo, and the Variations of Form exhibited in the Larvæ of Thirty-Eight Genera of Podophthalmia. By C. Spence Bate, F. R. S. (From the Proceedings of the Royal Society of London.) 8vo, pp. 4.

Die Aussern Lebensverhaltnisse der Seethiere. Von Prof. Carl Moebius. 4to, pp. 4.

Check-List of Preparations and Objects in the Section of Human Anatomy of the United States Army Medical Museum. For use during the International Exhibition of 1876, in connection with the representation of the Medical Department United States Army. No. 8. By George A. Otis, M. D., U. S. A. Washington, D. C. 1876. 8vo, pp. 135.

Hat Man in den interglaciären Ablagerungen in der Schweiz wirkliche Spuren von Menschen gefunden oder nur Spuren von Bibern. Von J. Steenstrup. (From Archiv für Anthropologie.) 1876. 4to, pp. 4.

The Prehistoric Remains which were Found on the Site of the City of Cincinnati, Ohio, with a Vindication of the "Cincinnati Tablet." By Robert Clarke. Cincinnati. 1876. 8vo, pp. 34.

GENERAL NOTES.

BOTANY.[1]

NOTES ON ALPINE AND SUBALPINE PLANTS IN VERMONT. — Now that the frosts have seared vegetation here, and our mountains are white with snow, I can make a full report to you of my summer's work in botanizing. I have occupied myself chiefly with a careful examination of the higher mountains of Vermont, and find their plants much more Alpine in character than they have heretofore been credited with being, so that in the next edition of your manual you need not, in giving the distribution of several species at least, skip over the Green Mountains in passing from the White Mountains to the Adirondacks.

On the summit of Mount Mansfield I have found *Diapensia Lapponica*, *Vaccinium cæspitosum*, and *Asplenium viride*, and on the summits of both Mansfield and Camel's Hump, *Polygonum viviparum*, *Salix Cutleri*, *Nabalus Bootii*, and *Aspidium fragrans*.

But I must tell you in particular of a region lying under the eastern base of the north peak of Mansfield, which is vastly richer in Willoughby plants than Willoughby itself. It is a narrow and deep gorge separating the bases of Mansfield and Sterling mountains. Through this "pass" runs a trail from Stowe Valley on the south to Cambridge in the Lamoille Valley on the north. It has long borne the name of "Smuggler's Notch," and will be remembered as the place where Pursh first discovered *Aspidium aculeatum* var. *Braunii*. Several botanists, since Pursh's day, have visited the station of this fern, — Tuckerman and Macrae and Frost, certainly, — but like Pursh they seem not to have left the trail except to gather supplies of the fern, which grows all over the bottom of the valley. The floor of the defile is strewn with masses of sharply angled rock which have fallen from the cliffs five hundred to one thousand feet high on either side. But a few rods from the trail, either to the right or left, we come to the foot of steep declivities formed of the finer débris from the cliffs, and covered like the whole valley with moderately-sized specimens of *Betula lutea* and other northern trees. It is from an eighth to a fourth of a mile to the top of these declivities, whence rise the perpendicular cliffs. These precipices extend along the sides of the pass for half a mile or more, being somewhat higher and more extensive on the western or Mansfield side than on the other. They are not continuous, but wherever streams of water from the mountain-sides extending high above fall over them, at least during spring and fall, they are broken into by deep clefts and chutes receding far backward and upward beyond their summits. Between these clefts sheer precipices like rounded towers rise hundreds of feet, and their dry summits are capped with a stunted growth of *Abies alba*.

[1] Conducted by PROF. G. L. GOODALE.

So, what with these dry and exposed rocks, with recesses always moist and shaded, a great diversity of situation is offered to plants. In one or two places, where the shade is deepest and the supply of moisture most abundant and constant, grows *Aspidium fragrans.* (This I have several times met with this season, under two of the precipices of the summit of Mansfield, at the base of the cliff of Camel's Hump near *Woodsia glabella*, and about Indian Falls on the Winooski River, in a line between these two mountains.) *Asplenium viride*, scarce under the south cliff of the summit of Mansfield, grows abundantly in thick tufts and mats all along the shaded bases of both the eastern and western cliffs, and in the deeper woods near by, and follows far up the mountain a stream which comes down from the "Lake of the Clouds," just below the summit of the north peak of Mansfield. *Saxifraga Aizoon*, seen only at Willoughby in some score of specimens, in this region carpets the open slopes and shelves all over these cliffs, just as *Antennaria plantaginifolia* covers the soil of old sterile fields. *S. aizoides* clings to all the moist rocks wherever it can get a foothold, and *S. oppositifolia* is only a little less common.

Of *Woodsia glabella* there is ten times as much here as Mr. Croydon and I found at Willoughby the past season, upon a close examination of the mountains on both sides of the lake, and it has planted itself in so many places impossible of access except to the birds that there is no danger of its ever being exterminated here.

The following plants are scattered freely over the cliffs: *Conioselinum Canadense, Artemisia Canadensis, Aster graminifolius, Hedysarum boreale, Astragalus alpinus, Carex scirpoidea*, and *Calamagrostis stricta.*

These three Willoughby plants I did not observe: *Arabis petræa, Draba incana*, and *Primula Mistassinica*, though it is quite possible that a visit made earlier than August, when I first entered the valley, might be rewarded by the discovery of the latter. As an offset to these, however, in the comparison of this Mansfield region with the Willoughby region we have, besides the two or three ferns already mentioned, *Pinguicula vulgaris* almost as abundant as the Saxifrages.

When the fearful drought of the past summer was at its height I spent most pleasantly several days in this cool and fresh mountain valley. Though I climbed to nearly every accessible place among the cliffs, I do not suppose I found every good thing the region holds.

A *Woodsia* which I found on one of the cliffs of Mansfield, proves to be *W. hyperborea.*

I also inclose a panicle of a *Calamagrostis* from Smuggler's Notch, which, if it be not *Langsdorffii*, seems to me to be near that species. [It appears to be *C. Langsdorffii.* — A. G.]

The range of the following plants may be extended. I have picked up on the shore of Lake Champlain, *Hierochloa borealis;* on the shore of the lake in Shelburn, Vt., as well as about the Lake of the Clouds,

on Mansfield, *Carex lenticularis*, and on the banks of the Winooski River, a few miles above the station of *Astragalus Robbinsii*, that rare grass, *Graphephorum melicuides*. Also, in this vicinity, *Vilfa vaginæflora*, and northward, on the sandy plains near the lake, *Eragrostis pertinacea;* also on the lake shore, *Physostegia Virginiana*. — *Communicated in a letter to Prof. A. Gray by* C. G. Pringle.

[Among Mr. Pringle's interesting discoveries should also be enumerated the rare *Habenaria rotundifolia*, found by him at Monkton, Vermont. A. G.]

The Two Bitter-Sweets. — One of the greatest difficulties that persons ignorant of botany have to contend with is the confusion of English names. Two plants, say, of very remote relationship or none at all, have come by some accident to be spoken of by the same title. An emigrant from the old country, finding a plant in the new that reminds him of home, calls it by the suggested name. Possibly some one in the next county applies the same title to an entirely different thing. Even here, in the United States, one cannot depend upon local names, which differ according to the tastes and fancies of the giver. Recognizing this difficulty, science has established a fixed nomenclature understood by all civilized peoples. When a name is given in this technical language it is understood in Russia or Switzerland as well as in America.

Our attention is at present attracted to this subject by the question which is put to us, "What is the difference between the two plants called bitter-sweet?" The bitter-sweet (*Solanum dulcamara*) is a plant of the nightshade family, with clusters of lilac or purple-colored, potato-like blossoms opening all summer. Generally one will find on the same specimen both flowers and fruit, and the last in varying conditions of maturity. Green and bright translucent red berries are often borne on the same stem. Now, this climber or half shrub, which is found everywhere about dwellings or trailing over walls, although not absolutely known to be poisonous, is still of doubtful relationship. The berries should be kept out of the hands of children. The plant is adventive from Europe, but is well established.

The shrubby or climbing bitter-sweet or staff-tree is polygamo-diœcious, the small greenish flowers appearing in June. The plant is a regular twiner, and often grows to a great height in trees. It is found along streams and lakes, and we have generally seen it fruiting best near tide-water. It is the *Celastrus scandens* of botanists, and belongs to the order *Celastraceæ*. It sometimes has the local name of Roxbury wax-work. The charm of this plant is in its beautiful orange-colored pods, which in late autumn open and reveal the scarlet arils of the seeds. Clusters of these fruits are very beautiful in winter decorations displayed over pictures or mirrors. The well-known burning-bush (*Euonymus*) belongs to the same family. So far as we know, the *Celastrus* is innocent, but the *Euonymus* is reputed dangerous. Neither of the plants known as bitter sweet is poisonous to the touch. — W. W. Bailey.

THE NUTRITION OF PLANTS. — Sig. Cugini has recently contributed to the *Nuovo Giornale Botanico Italiano* a very elaborate paper on the alimentation of cellular plants. In his Text-Book of Botany, Sachs arranges the elements which are necessary to the nutrition of plants in three series, in the order of their importance, thus : —

Carbon, Hydrogen, Oxygen, Nitrogen, Sulphur.
Potassium, Calcium, Magnesium, Iron.
Phosphorus, Chlorine.

Cugini would arrange them thus, in five series instead of three : —

Carbon, Hydrogen, Oxygen, Nitrogen.
Sulphur.
Potassium, Phosphorus.
Iron, Magnesium,
Silicon.

The modes in which these elements are combined before they can serve for the nutrition of the plant are expressed in the following table of the proximate food-materials of plants, —

Necessary	Organic carbon-compounds, Water, An ammoniacal salt, Sulphates of potassium and iron, Phosphate of magnesium, An alkaline silicate.
Occasional	Chloride, Iodide, Bromide } of sodium or potassium, Phosphate, nitrate, or sulphate of calcium, Salts of zinc, manganese, and aluminium.

Potassium the author considers to have an altogether different function from that of any other element, and to bear a somewhat similar relationship to the carbohydrates to that which phosphorus bears to the albuminoids. Calcium he does not regard as an indispensable element. Iron must be considered so from its peculiar relationship to the coloring matter of chlorophyll. He is unable to assign any special function to magnesium, although it appears to be essential. — A. W. BENNETT.

THE RELATIVE FERTILITY OF CROSS-FERTILIZATION AND SELF-FERTILIZATION. — It is generally known that Mr. Darwin has in hand a special work on this subject, to which he has devoted so much attention. In the mean time the botanist who has probably, next to Darwin, contributed most to our knowledge of the relation of fertility to the mode of fertilization in plants, Professor Delpino, of Italy, has published the results of his own observations. He divides the mode of fertilization in different plants into the following kinds: (1.) The anthers pollinate and fecundate the stigma of the same hermaphrodite flower: *homoclinic homogamy.* (2.) The anthers pollinate and fecundate the stigma in another flower of the same inflorescence, whether the flowers are hermaphrodite, unisexual, or polygamous: *homocephalic homogamy.* (3.) The anthers of one flower pollinate and fecundate the stigma of a flower belonging to a different inflorescence on the same individual, whether hermaphrodite, unisexual, or polygamous; *monœcious homog-*

amy. (4.) The anthers of a flower on any individual plant pollinate and fecundate only the flowers on a different individual, whether the flowers be hermaphrodite, polygamous, monœcious, or diœcious: *dichogamy.* A number of experiments on the artificial fecundation of plants in the four different modes indicated above point to the conclusion that their relative fertility is in the inverse order to that in which they have been mentioned. Professor Delpino promises an additional paper on cleistogamous or closed self-fertilized flowers. — A. W. Bennett.

Alpine Plants of the White Mountains. — We are glad to call attention to the following announcement: —

Collections of the Alpine and sub-Alpine plants of the White Mountains, N. H., containing more than fifty species, have been made during the past season, by William F. Flint and J. H. Huntington.

The number of sets is limited to fifty. They have been carefully arranged and ticketed, and will be sent by mail upon the receipt of five dollars ($5.00). Address William F. Flint, Hanover, N. H. (Box 348.)

Botanical Papers in Recent Periodicals. — *Comptes rendus*, No. 8. Saintpierre and Magnieu, Researches on the Gas contained in the Fruits of *Colutea arborescens.* No. 9. De Luca, On the Alcoholic and Acetic Fermentation in the Fruits, Flowers, and Leaves of certain Plants. L. Fautrat, On the Influence exerted by Pine Forests on the Amount of Rainfall. No. 10. Renault, On the Silicified Plants of Autun.

Flora, No. 26. Nylander, New Cuban Lichens (Species of Ramalina) from Mr. Charles Wright's Collections. De Krempelhuber, New Brazilian Lichens. No. 27. De Thümen, Fungi from South Africa.

Botanische Zeitung, No. 37. Philippi, Notes on *Fuchsia macrostemma* and its Near Relatives. Philippi, Note respecting the Production of Wood after Injury in *Acacia decipiens.* No. 38. Reports of Societies. Sorokin, On *Morchella bispora.* No. 39. Salomonsen, On the Isolation of Different Forms of Bacteria. No. 40. Schenk, On Fossil Equisetaceæ.

ZOÖLOGY.

New Shells from Colorado. — Mrs. M. A. Maxwell, of Boulder, Colorado, exhibited at the Centennial Exhibition a large number of animals and birds which attracted a great deal of attention. She brought with her a box of miscellaneous land and fresh-water shells gathered in the immediate vicinity of her home at Boulder, which is a few miles northeast of Denver, at an elevation above the sea of about 5535 feet. These shells she kindly entrusted to me for examination, and they seem to me worthy of notice, as they add materially to the previously known molluscan fauna of the State. In my report upon the Mollusks of Colorado, published by Dr. F. V. Hayden in 1874,[1] I

[1] Annual Report of the United States Geological and Geographical Survey, 1874, pages 385–410. The Mollusks of the Rocky Mountains: Popular Science Monthly, vol. ix., May, 1876.

endeavored to give the entire list of mollusks then known to inhabit Colorado, and also all within the Great Plains on the east and the crests of the Sierra Nevada range on the west, these being the limits assigned by Mr. W. G. Binney to his "Central Province." "Tabulating the sum of the information open to me, and including my own summer's work, I found that one hundred and thirty-eight nominal species had been recorded as occurring in this inter-montanic region. Of these forty-nine were also Californian species; fifteen occurred also in the Eastern United States; eight hailed from the Colorado Desert; seven were found all over the continent, eight all over the world, and three belonged in the Eastern Province west of the Alleghanies only. This left forty-seven nominal species whose range, so far as yet known, is confined to the Central Province." To this list I am now able to add six new names, as follows: ? *Limnea lepida* Gld. ? *Physa inflata* Lea. *Planorbis bicarinatus* Say. *Goniobasis pulchella* Anth. *Goniobasis livescens* Menke. *Anodonta* ——?

All of these are new not only to Colorado, but to the whole province, so far as I can ascertain, except *Planorbis bicarinatus*, which has been reported from the Yellowstone. It will be observed that all of these are Eastern forms, except the Anodon, which may turn out to be new, or related to Californian species. We very much need further collections from these mountainous territories, the least of which will cast some light upon the geographical distribution of our mollusks over the extensive and greatly diversified areas which they inhabit, the conditions which determine their being wide-spread or restricted in their range, and the variations which may manifest themselves in form or habit.

Following is given a list of Mrs. Maxwell's collection, with remarks:

Zonites arboreus Say. Many specimens. Common in the State.

Zonites fulvus Drap. Several specimens of this very common shell.

Patula Cooperi W. G. B. Said to be abundant about Boulder, which is the first mention of its occurrence on the eastern slope of the range. Among the large number of specimens several are marked very distinctly from all the rest with "broader longitudinal and spiral patches of reddish brown," or burnt umber, as is mentioned in Binney's original description. They are difficult to distinguish from *P. solitaria*. As usual nearly all of the shells were found dead. The species seems to be dying out.

Patula striatella Anth. Four specimens.

Helix pulchella Müll. Abundant.

Cionella subcylindrica L. A few.

An exceedingly minute *Vertigo* with toothed aperture is represented by three specimens, but I cannot yet determine it.

Succinea lineata W. G. B. Several specimens.

Succinea Nuttalliana Lea. Two examples of a variety differing from the type mainly in having a smoother external surface.

? *Limnea lepida* Gld. Some young specimens, probably referable to this species.

Limnophysa desidiosa Say. Several specimens; not uncommon in that region.

Limnophysa humilis Say. Some examples of this shell, which is probably numerous throughout the Territories.

? *Physa inflata* Lea. Dr. James Lewis, who examined the fluviatiles of this collection, queries this identification, but admits that the type extends from Virginia to Colorado. Mr. Binney regards it as a synonym of *P. heterostropha*. There seem to be two specimens, of different ages.

Physa heterostropha Say. Many specimens of various sizes, but as near New York shells as well can be. It is hard to draw the boundary of variation here. Some of the specimens are thickly coated with rust from the iron-waters in which they have lived, and others with a white deposition accumulated from the water. They occur in great abundance everywhere among the mountains.

There is a *Bulinus* which looks as if it might be a variety of *B. hypnorum*, but is scarcely identifiable with that species.

Planorbis (*Helisoma*) *plexata* Ing. Three examples of this species, first described from my specimens, are among this lot, the largest and oldest one showing the twisted appearance very plainly.

Planorbis bicarinatus Say. This well-known shell is now first reported from Colorado, but has been found on the Yellowstone. These examples are of average size. The common *P. trivolvis* is not included in this collection.

Gyraulus parvus Say. Quantities of this shell, very common in Colorado.

Two imperfect specimens represent a diminutive *Ancylus* which it is difficult to name, but which somewhat resembles *A. diaphana*.

Goniobasis pulchella Anth. Several characteristic examples.

Goniobasis livescens Menke. A number of specimens.

Anodonta ——? There is a single well-preserved example of an Anodon to which Dr. Lewis says he knows no reference, but has seen similar ones (not named) from California. It is about two inches long, brown and smooth without, somewhat decorticated over a large area, at the beaks, and lustrous blue within, changing to bronze under the hinges. Several much smaller ones of similar shape, but lighter-colored and thinner, may be the young of the former. If, as Dr. Lewis suggests, this should prove to be an undescribed species, it ought certainly to be dedicated to the energetic naturalist to whose intelligence and care we are indebted for this interesting collection of Colorado mollusks.

Sphærium striatinum Lam. Two specimens in fine condition, of medium size, but varying somewhat from the type toward *S. sulcatum*.

Pisidium abditum Hald. A large quantity of these shells which are vastly abundant in places all through the West. — Ernest Ingersoll.

ANTHROPOLOGY.

ANTHROPOLOGICAL NEWS. — The Academy of Natural Sciences of Davenport, Iowa, has issued its first volume of proceedings, covering the time from 1867 to 1876. The volume is well illustrated by plates, chiefly archæological, and is certainly a praiseworthy effort by an infant society. There are a large number of archæological papers reported, relating principally to mound explorations in the State and in Whiteside County, Illinois. The papers by Dr. Farquharson are of extraordinary merit, especially in those portions which relate to the copper axes and to the cloth wrappings found on many of them.

The third number of the *Revue d'Anthropologie* has appeared, rich in original matter and in reviews of progress. The first article is by M. Tissot, upon the megalithic monuments and the blonde populations of Morocco. The monuments are precisely similar in nature to those found in Western Europe and in Algiers, consisting of dolmens, tumuli, menhirs, and cromlechs. The inhabitants of Morocco consist of: (1) two races of European physiognomy, the one blonde, the other brown, corresponding to the two races, blonde and brown, found in France (Libyans par excellence); (2) a brown race with southern characteristics, but still European (Getules?); (3) a brown race of Oriental origin (Numidians?); (4) a brown race, probably Berber, but crossed with the black race (Melano-Getules).

M. Broca, the editor, follows up the paper of M. Tissot with a learned discussion of the relation of these megalithic remains to those of Algiers, particularly as settling the mooted question of a migration into Africa through Sicily and Sardinia rather than across the Straits of Gibraltar. M. Broca in referring to the blonde Berbers combats the theory of Shaw that they are the descendants of the Vandals of Genseric. From allusions in classic authors we are led to infer the presence of this blonde element for at least fifteen centuries B. C. The works of M. de Löher are referred to, and an address of congratulation to him quoted as an example of the slight evidence which will suffice a philologist when his national preferences overrule his judgment.

The second article is an account of an elaborate study upon Netherland crania, by Dr. Sasse. The next article is by Mme. Clemence Royer, a very diligent student but not always a safe guide, upon the origin of funeral rites and their manifestations in prehistoric times. It is an attempt to apply the evolution hypothesis to the subject of sepulture. The instinctive veneration for the dead is traced primarily to the natural abhorrence of dead bodies inspired in most animals by their poison, their infection, and the abundance of stinging flies, etc., which gather around them. This has led some apes to cover their dead with boughs and sticks. From these the modes of burial naturally follow. The first great class is where the corpse is not touched, including absolute aban-

donment, slight coverings, heaps of stones, tumuli, cave and hut abandonment, etc. The first occurrence of touching the corpse was where the instinct of preservation, induced by crowding, overcame the fear of the dead, and thus by the transporting of the dead of one cave to the side of a dead relative in another, an act of devotion saves the cave dwelling to the occupants and originates the whole series of interments in which the corpse is moved. The most ingenious application is made of these theories to inhumation, abandonment to beasts and birds, throwing into rivers and into the sea, desiccation and embalming, exposure on scaffolds, incineration, etc. An attempt is made in the last chapters to trace out ethnic affinities by these modes of burial.

Dr. A. Morice contributes an article upon acclimation in Cochin China. The reviews upon anthropological publications and researches are exceedingly fine, especially that of Dr. Collineau upon the craniological and craniometric instructions of the Anthropological Society of Paris, occupying nearly thirty pages of finely printed matter and illustrated with ten wood-cuts. The bibliographical references alone render this periodical absolutely indispensable to the anthropological student.

The eighth number of *Matériaux* contains a review of Count J. Gozzadini's charming monograph upon some bronze horse-trappings from Italy and the bronze sword of Ronzano. The original is fully illustrated with plates. James C. Southal's Recent Origin of Man is reviewed by M. L. Reoult de Neuville. The remainder of the number is taken up with matters purely French.

The Rede Lecture for 1876, The Monumental History of Egypt, was delivered May 26th by Samuel Birch. It is published in pamphlet form by Samuel Bagster.

The third session of the International Congress of Orientalists was opened at St. Petersburg, Friday, September 1st, with M. Gregorrew as president. Nine sections were formed and a chairman elected for each. The subjects to which the sections were devoted were as follows: (1.) East and West Siberia. (2.) Middle Asia within Russian boundaries, as well as the independent principalities of Western Turkestan. (3.) Caucasia, as well as the Crimea and other parts of European Russia inhabited by Asiatic peoples. (4.) Transcaucasus, including ancient Georgia and Armenia. (5.) Eastern Turkestan, Thibet, Mongolia, with Mantchooria and the Corea, China, and Japan. (6.) India, Afghanistan, Persia, and the Indo-Chinese Archipelago. (7.) Turkey, including Arabia and Egypt. (8.) Archæology and Numismatics. (9.) The Religious and Philosophical Systems of the East.

M. Leon de Rosny, the president of Section 5, called the attention of the congress to the question of the discovery of America by the Chinese before the time of Columbus.

The meeting of the British Association for the Advancement of Science commenced September 6th. The president of the biological

section also opened the subsection of anthropology. In his address, after giving a brief and general sketch of the modern doctrine of the antiquity and origin of man, Mr. Alfred R. Wallace devoted the remainder of his remarks to the far more momentous and exciting problem of the development of man from some lower animal form. He observed that in the last sixteen years scientific men have passed from one extreme of belief to the other, — from a profession of total ignorance as to the mode of origin of all living beings to a claim of almost complete knowledge of the whole progress of the universe from the first speck of protoplasm up to the highest development of the human intellect. Mr. Wallace, believing that the facts which oppose this theory receive hardly their due attention, that opposition is the best incentive to progress, and that it is not well even for the best theories to have it all their own way, directed the attention of his hearers to some of the facts, and to the conclusions fairly deducible from them.

Papers were read by Lieutenant Cameron, Mr. Pengelly, M. Tiddemann, and Professor Barrett.

The French Association for the Advancement of Science met August 16th at Clermont. M. Gabriel de Mortillet was chosen president of the Section of Anthropology. The subject of his opening address was the Origin of Superstitions. Papers were read by MM. Broca, Tubino, Ollier de Marchand, Vacher, Roujon, and Hovelacque.

The American Archæological Convention met in Philadelphia, in the Centennial Judges' Hall, on the 6th of September. A permanent organization was formed, called the American Anthropological Association, with Dr. C. C. Jones as president and Rev. H. D. Peet as secretary. — O. T. Mason.

GEOLOGY AND PALÆONTOLOGY.

Cretaceous Vertebrates of the Upper Missouri. — Professor Cope has recently returned from an exploration of the Fort Union beds of the Upper Missouri, especially those discovered by Dr. Hayden in 1855 at the mouth of the Judith River. Attention was given to the relation of this formation to the underlying marine cretaceous beds, and to the respective faunæ of the two as compared with that of the early eocene period. The fauna was found to be terrestrial and lacustrine, including great numbers of *Unionidæ*, *Lepidosteus*, *Ceratodus*, and a form probably of rays; of crocodiles, fresh-water turtles, Sauropterygian and Dinosaurian reptiles. The *Dinosauria* constitute the most abundant and characteristic form of life, eighteen species having been found, of which eight were of the carnivorous (*Goniopodous*) and ten of the herbivorous (Orthopodous) type. The predominant genus of the former is *Lælaps*, of the latter, *Dysganus*, of both of which several species were found.

The facies of this fauna is thus plainly mesozoic and cretaceous, adding

weight to the arguments already adduced to this effect. But the change from the fauna of the underlying cretaceous numbers four and five is very striking, the genera and often higher groups being quite different. The types of the marine beds were found to be *Pythonomorpha*, *Elasmosaurus*, *Plesiosaurus*, *Enchodus*, chimærids and sharks, with marine *Cephalopoda*, etc. Nevertheless the physical transition between the marine and lacustrine formations appears to be complete, as indicated by Professor Hayden.

Powell's Geology of the Uinta Mountains.[1] The field work reported on by this important volume was done between the years 1868 and 1875, among the Uinta Mountains and adjacent regions, covering portions of Wyoming south of the Pacific Railroad and of Utah. This region is of great general geological interest, and its geology has been discussed by Major Powell in an able and original way. Particular attention has been paid to facts relating to mountain-building, the amount of denudation and displacement of strata in these mountains being fully discussed and graphically represented. The Bird's-Eye View of a Part of the Uinta Uplift, in the atlas, well illustrates the author's manner of representing the orography of an extensive plateau area. The formations described have an aggregate thickness of fifty thousand feet, and embrace groups of palæozoic, mesozoic, and cenozoic age. The palæontology has been elaborated by Dr. C. A. White. The geological maps and sections are of a high degree of interest and of much practical importance.

GEOGRAPHY AND EXPLORATION.

Return of the British Arctic Expedition. — The following note is condensed from the newspaper reports. The British Arctic Expedition under Captain Nares returned to England, October 27th. The Alert and Discovery left Fort Foulke on July 29, 1875, and entered the ice off Cape Sable. After a severe and continuous struggle they reached the north side of Lady Franklin Bay, where the Discovery was left in winter quarters. The Alert pushed on and reached the limit of navigation on the shore of the Polar Sea. The ice varied in thickness, being in some places one hundred and fifty feet thick. President Land does not exist.

The Alert wintered in latitude 82° 27′. At this point the sun was invisible one hundred and forty-two days, and a temperature the lowest ever recorded was experienced, being fifty-nine degrees below zero for a fortnight, and falling once to one hundred and four degrees below the freezing point. A detachment with sledges was dispatched northward. It was absent seventy days, and reached latitude 83° 20′. Another party rounded Cape Columbia, the northwest point of America, and traced two hundred and twenty miles westward from Greenland, and also explored far to the eastward.

[1] Report on the Geology of the Eastern Portion of the Uinta Mountains and a Region of Country adjacent thereto. With Atlas. By J. W. Powell. Washington. 1876. 4to, pp. 218.

During the sledge journeys the ice was so ragged that it was only possible to advance a mile a day.

During the winter rich collections in natural history were made and many valuable scientific observations were taken. Excellent coal was found near the place where the Discovery wintered.

A member of the expedition telegraphs to the *Daily News* that the northernmost land reached was in latitude 83° 07′. After that there was ice. The point farthest west reached was in longitude 85°. Lady Franklin's Straits are really a bay. Petermann Fiord was closed by a glacier. The northernmost point of Greenland seen was in latitude 82° 57′.

The New Route to China. — The following details are given in the daily papers of the remarkable discovery of Professor Nordenskiold, the Swedish explorer, already reported by telegraph: —

"He reports having encountered no obstacles, and considers the way now quite open from Europe to China *via* the northern passage and the valley of the Yenisei River, by which steam communication is obtained across Siberia and almost to the frontiers of China. An immense unmeasured area of extremely fertile and valuable soil was found in this region, all of which is accessible for immediate cultivation.

"The commercial value and the important results to flow from this demonstration of the feasibility of a northeastern passage to Siberia and China can hardly be foreseen or overestimated. Nordenskiold, whose letter is unfortunately brief, writes that he has also obtained results of great interest to science. Dredging and scientific observations were constantly carried on during the entire voyage. Large accessions have been made to the previously obtained collections from this heretofore unknown region. One of the unexpectedly favorable phenomena of the passage, the professor reports, was that the water was uniformly found to be surprisingly warm."

MICROSCOPY.[1]

Van der Weyde's Oblique Illuminator. — At the Indianapolis meeting of the American Association for the Advancement of Science, in August, 1871, P. H. Van der Weyde, of New York, described a contrivance, believed to be new, for oblique illumination of transparent objects. It was designed chiefly to facilitate the resolution of lined or dotted objects, and consisted of a plane mirror lying beneath the object-slide and parallel to it, from which mirror light, condensed upon it from above by means of a bull's-eye condenser would be reflected back at the same angle through the object and into the objective. These illuminators were shown in successful operation at the meeting, working best with moderately high powers, and were freely distributed among the members present. They were briefly described in the Naturalist for

[1] Conducted by Dr. R. H. Ward, Troy, N. Y.

September, 1871, being there estimated as "a little expedient of great practical convenience." Ever since that time the present writer, among others, has used them habitually, shown them freely, and not unfrequently given them away. The mirror may be either of silvered glass or of polished metal. In some cases the object-slide may lie directly upon it while it rests upon the stage; but frequently the object-slide is best elevated slightly above it. The mirror is most conveniently made of the size of a slide (3x1) and furnished with glass strips at the ends to support the slide at any required height; but it may be made smaller, say one inch square or round, and sunken in a brass or wooden stage-plate, or for stands having a sub-stage of any kind it may be made of suitable size and supported from the sub-stage and adjusted for height in the same manner as the achromatic condenser. It has the advantage of great ease of manipulation and applicability to any stand, and the drawback of being liable to be interfered with by the presence on the slide of such obstructions as paper covers or opaque cells or rings of varnish. Within a few months past it has been brought forward by Rev. John Bramhall, of Lynn, England; its previous use and publication having either escaped the notice or slipped from the memory of himself as well as of the distinguished microscopist who has indorsed it and proposed to name it after him.

The Richmond Fossil Earth. — The recent excavation of a tunnel by the Chesapeake and Ohio Railroad Company, through that part of the city of Richmond, Va., known as Church Hill, has intersected this famous deposit for a distance of three fourths of a mile, and afforded rare facilities for study and the collection of material. C. L. Peticolas of Richmond, who has given great attention to the work of obtaining this interesting material and preparing it for use, describes the stratum as from forty to sixty feet thick, and situated, nearly level, about fifteen to twenty-five feet below the level of the city and one hundred feet above tide water. Before exposure to the air it is tough and hard, having the color and solidity of bituminous coal and requiring to be removed from the tunnel by means of blasting; but after exposure for some time it crumbles to a fine powder of almost snowy whiteness, consisting in general of about one half fine pure clay, one fourth fine white sand, and one fourth fossil diatoms interspersed with many sponge spicules and a few Polycystina. The abundance and variety of the fossil forms vary greatly in different parts of the stratum, the lower levels being the richer.

Micro-Photographs in Histology. — The monthly series of illustrations of normal and pathological histology, by Dr. Carl Seiler in connection with Drs. J. G. Hunt and J. G. Richardson, has advanced sufficiently far to indicate its character but not its scope. The numbers contain four plates each, representing microscopical views of tissues, mostly human, printed by a photo-mechanical process that gives the

appearances under the lens with the rigid candor of ordinary photography. Of the selection of objects it is impossible to judge from a few numbers. The text is a slightly amplified description of the plates. The work will be a luxury to those who are not practiced in the use of the microscope, and a convenience, as an excellent memorandum, to those who are.

VOLATILIZED GOLD. — Mr. John Hewston, Jr., of San Francisco, Cal., has prepared beautiful mounts of gold obtained from the condensing chambers connected with the smelting furnaces. The gold is in the state of brilliant globules of pure metal, and suggests the loss that must be continually taking place during the smelting process.

DIATOMS AS FERTILIZERS. — The miserable attempt to establish the presence of diatoms in the tissues of plants and their consequent (?) importance to the plants as food, which inadvertently was printed in the *American Journal of Science and Arts* for June, 1876, seems not to have been intended as a hoax, after all. It looked like such a capital burlesque upon the follies of scientific puffing of commercial articles that it was almost impossible to consider it as intended for anything else. It has been exposed sufficiently long, however, notably in the *American Journal of Microscopy*, to give ample time for its real design to come out, and in absence of proof to the contrary it must be regarded as one of the most preposterous advertising tricks of the day. In the face of its absurdities it is hardly worth while seriously to discuss the still doubtful value of infusorial earths as fertilizers, or their probably injurious effects upon some kinds of soil.

EXCHANGES. — Julien Deby, C. E., of Brussels, is engaged in studying the fossil diatoms of Belgium, and would be glad to exchange Belgian material of this class for specimens from American deposits. Also, correspondence desired in regard to exchange of microscopical specimens and publications. Mr. Deby may be addressed, care of the editor of this department, 53 Fourth Street, Troy, N. Y.

Slides of gold-bearing quartz from California, for good mounted objects; polarizing preferred. S. R. Hatch, Milford, Mass.

SCIENTIFIC NEWS.

— So alarming and wide-spread have been the ravages of the locusts in the trans-Mississippi States and Territories, during the last few years, that there is a general demand by the people for united state and national action in investigating the habits and devising means for staying the ravages of the migratory locust of the West. To this end, and in accordance with a call issued a few weeks ago by Governor Pillsbury, of Minnesota, a meeting of the governors of the Western States and Territories took place in Omaha, Nebraska, October 25th, to devise means to rid the country of the grasshopper pests. The States were represented

as follows: Nebraska, Governor Silas Garber, ex-Governor Furnas, Professor Wilbur, and Prof. A. D. Williams; Dakota, Governor John L. Pennington; Minnesota, Governor Pillsbury, Professor Whitman, and Mr. Pennock Pusey; Iowa, Governor Kirkwood; Illinois, Prof. C. W. Thomas of Carbondale, Governor Beveridge being ill; Missouri, Governor Hardin and Prof. C. V. Riley.

The meeting was organized by the election of Governor Pillsbury as chairman, and Professor Riley and Mr. Pusey as secretaries.

The Governor of Minnesota made a brief address on the objects of the meeting, and suggested that steps be taken to memorialize Congress to appoint a commission of scientific men to visit the districts suffering from the grasshopper pest, and investigate the subject.

This brought out a discussion which was participated in by nearly all the gentlemen present, the most important speeches being made by Governor Pennington of Dakota, Professor Riley of Missouri, Governor Kirkwood of Iowa, Professor Thomas of Illinois, and ex-Governor Furnas of Nebraska.

Prof. C. V. Riley briefly narrated the habits and history of the pest, and gave sound practical advice. He considered that there were two main questions before the conference: first, the consideration of how best to deal with the young insects that threaten to hatch out over a vast extent of the country next spring, and second, the investigation of the insect in its native home, with a view of preventing its migrations into the country to the southeast. For the first, he advised some well-digested plan of action that would give confidence to the people and insure concert of action; mentioning, among other things, the offering of rewards by the several States and counties for the eggs and newly hatched hoppers, as recommended in his last report, and systematic burning and ditching. For the second, he urged an appeal to Congress to add a special appropriation to the sundry civil service bill, to defray the expenses of a commission of three experts, to be appointed by and to work under Prof. F. V. Hayden, in charge of the United States Geological Survey of the Territories, who, with his experience and skill in organization, could materially assist such a commission. In the evening the conference met again and, after deliberating, appointed a committee of six, composed of the chairman, Messrs. Riley, Osborn, Wilbur, Thomas, and Williams, to present a series of resolutions and suggestions for the farmers of the country, and a memorial to Congress for discussion and adoption.

— Count Gaston de Saporta, the distinguished French botanical palæontologist, has recently been appointed to a professorship in the Jardin des Plantes in Brongniart's place.

— Mr. S. E. Cassino, Naturalists' Agency, Salem, Mass., announces the publication in December of The Land-Birds and Game-Birds of New England, by H. D. Minot, 8vo, 400 pages; and in January of a Naturalist Directory, which we are sure will prove very serviceable and timely.

— Under date of September 29th, Prof. O. A. Derby, of the Brazilian

Geological Commission under Prof. Ch. Fred. Hartt, writes that he (Derby), H. H. Smith, and Senhor Freitas have discovered one thousand feet of Devonian beds below the Ererê beds discovered in 1870 by Smith and himself. Of this, several hundred feet are Oriskany sandstone, rich in fossils of Devonian aspect, including North American characteristic species. Carboniferous beds occur in the same region, and they now have a complete section from the base of the Devonian to recent formations, in the lower Amazonian valley.

— At the meeting of the National Academy of Sciences, held in Philadelphia, October 17–19, 1876, the following gentlemen were elected members: G. F. Barker, J. A. Allen, W. M. Gabb, E. S. Morse, and John Newton. The following papers on natural science were read: The Results of an Investigation upon the Transformations of *Planorbis multiformis*, by Alpheus Hyatt; On the Geological Structure and Topographical Aspects of the Catskill Mountains, by James Hall; On the Physical Structure and Altitudes of the Southern Groups of the Catskill Mountains, by Arnold Guyot.

— The forty-sixth annual session of the British Association for the Advancement of Science was opened September 6th at Glasgow, by the address of the president, Professor Andrews. Prof. J. Young delivered the opening address before the geological section, Alfred R. Wallace that in the section of biology, Prof. Alfred Newton that in the department of zoölogy and botany of the section of biology, and Capt. F. J. Evans that in the section of geography. Section A, mathematical and physical science, was presided over by Sir William Thompson, who made some flattering allusions to the present condition of American physical science.

— The French Association for the Advancement of Science held its meeting in August, under the presidency of M. Dumas.

— On September 12th the geographical congress convened by the King of Belgium met at Brussels, under the presidency of his majesty.

— As regards *Bathybius*, which is now again attracting notice, more however in clerical than in scientific circles, it may be said that while Professors Wyville Thompson and Huxley have been inclined to doubt whether this is an organism, Dr. Bessels, of the Polaris expedition, discovered in Smith's Sound a form almost exactly like *Bathybius*, which, however, he judged to be still simpler than *Bathybius* and accordingly named *Protobathybius*. A description and a figure of it are given from drawings and notes furnished by the author in Packard's Life Histories of Animals. Even if *Bathybius* should prove to be inorganic, we have *Protobathybius Robesonii* left, and several allied forms of simple Monera, such as *Protamœba protogenes*, and others, which are simple drop-like masses of protoplasm, even without a nucleus. All these animals or plants, it matters not which, but most probably the former, are placed by Haeckel in his *Monera*, a division of organisms adopted by Huxley in a recent paper.

PROCEEDINGS OF SOCIETIES.

ACADEMY OF NATURAL SCIENCES, Philadelphia. — July 25th. Dr. Allen called attention to a photograph of a Brahmin bull, exhibiting the growth from the back of the animal of a supernumerary anterior extremity. The peculiarities of the limb were described, and its importance from an embryological point of view was alluded to. Mr. Martindale stated that the bull spoken of by Dr. Allen had been removed to Newark, but that there was still on exhibition a heifer having two anterior limbs growing from the shoulders.

Mr. Meehan called attention to a peculiar diurnal motion he had observed in *Liatris pycnostachya* when throwing up its flower stems: the top was always curved over towards the east in early morning, nearly erect at midday, and towards the west at sundown. For commercial purposes he had thousands of plants growing, and the habit was uniform in all. The motion was evidently vertical and not in a horizontal direction, and this still left it open to ascertain how the point turned towards the east for its early morning start. As soon as the flower spike approached its full growth the motion ceased.

Professor Cope spoke of the development of the upper incisors in a species of fossil camel. The species had been called *Procamelus heterodontus*, but it had recently been found that the true *Procamelus* does not present a complete series of upper incisors. The stages of growth of the teeth of *Procamelus* were described, and the genus having the perfect series of incisors was named *Protolabis*. The name *Protolabis heterodontus* was proposed for the type. A new species of *Procamelus* was indicated under the name *fissidens*.

A letter from Joseph Menges, of Frankfort-on-the-Main, applying for assistance to enable him to explore the region of the Red Sea, was, on motion, referred to the council.

Professor Kerr called attention to a peculiar feature of surface geology of North Carolina. No well-characterized evidence of the glacial age had been found as far south as South Carolina, but in the foot-hills east of the Blue Ridge occurred peculiar superficial deposits, the nature of which had been for some time uncertain. The gold of North Carolina occurs in gravel beds as in California, at the upper surface of the rock upon which such sandy deposits lie. The beds alluded to were evidently not moved by water, and the material of which they are composed shows a peculiar succession of forms of deposits, proving them to be not moraines or the result of glacial action. Angular pebbles exhibiting no evidence of attrition are found some distance below the surface, towards the upper part of the hills. Lower down these pebbles are more rounded and are nearer the underlying rock. It was believed that the earth of the deposits had been frozen and had moved as if it were a glacier. The same characteristic deposit had been observed in the neighborhood of West Market Street, exhibiting features tending to strengthen the theory ad-

vanced. The subject was further considered by Messrs. Le Conte, Koenig, Kerr, and Gabb.

The following papers were presented for publication: Report on the Hydroids collected on the Coast of Alaska and the Aleutian Isles by W. H. Dall, United States Coast Survey, and party, from 1871 to 1874 inclusive, by S. F. Clarke, with an introduction by W. H. Dall. Description of a Collection of Fossils made by Dr. Raimondi in Peru, by Wm. M. Gabb. The Rocks known as Mexican Onyx, by Mariano Barcena.

The Academy has created thirteen professorships of the various branches of natural history, and has enacted that the council shall elect thirteen professors as soon as suitably qualified candidates shall offer. Applications for positions to be addressed to the president of the council or to the section of the academy to which the subject selected by the applicant has been confided, accompanied by such testimonials as he may be pleased to submit. No professor to be elected prior to the stated meeting of the council in October, 1876. It is the duty of each professor to preserve, classify, and increase the collections in his department, and report annually their condition and needs to the council, to give special or objective instruction to the beneficiaries of scholarships in the Academy, and to deliver courses of lectures under such regulations as the council may establish. No rate of compensation or source of compensation has yet been provided.

SCIENTIFIC SERIALS.[1]

Monthly Microscopical Journal. — October. Bastian and Pasteur on Spontaneous Generation, by H. J. Slack. The Markings of *Frustulia saxonica*, by S. Wells. On the Present Limits of Vision, by R. Pigott. On the Structure and Development of Connective Substances, by T. E. Satterthwaite.

Quarterly Journal of Microscopical Science. — October. Résumé of Recent Contributions to our Knowledge of Fresh-Water Rhizopoda. Part I. Heliozoa, by W. Archer. On the Coincidence of the Blastopore and Anus in *Paludina vivipara*, by E. R. Lankester. The Termination of the Nerves in the Vestibule and Semicircular Canals of Mammals, by U. Pritchard.

The Geographical Magazine. — October. Servia, Bosnia, and Bulgaria. The Distribution of the Population in the Part of Europe overrun by Turks, by E. G. Ravenstein. The Fisheries of Denmark, the Faero Islands, and Iceland. Wrangell Land. Sketches of Life in Greenland. A Peep into Kokan, by D. Ker. The Geographical Conference at Brussels.

American Journal of Science and Arts. — November. Notice of New Tertiary Mammals, by O. C. Marsh.

[1] The articles enumerated under this head will be for the most part selected.

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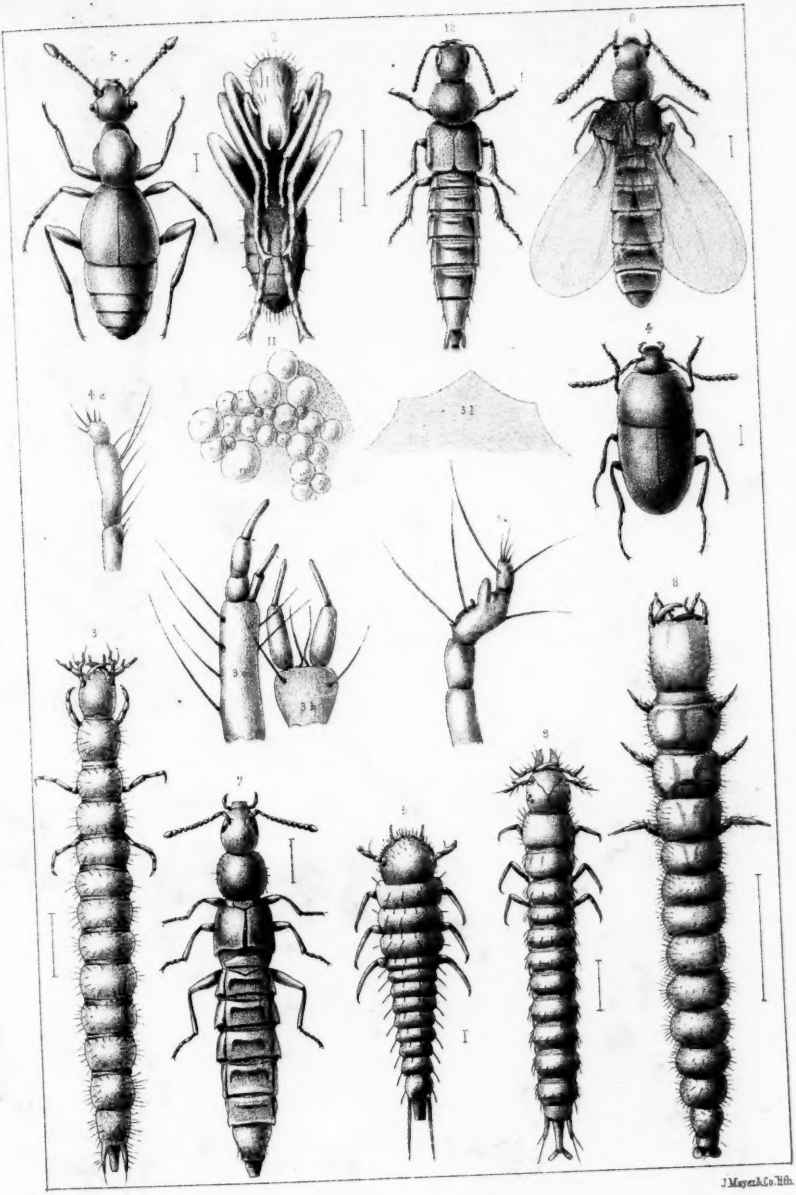

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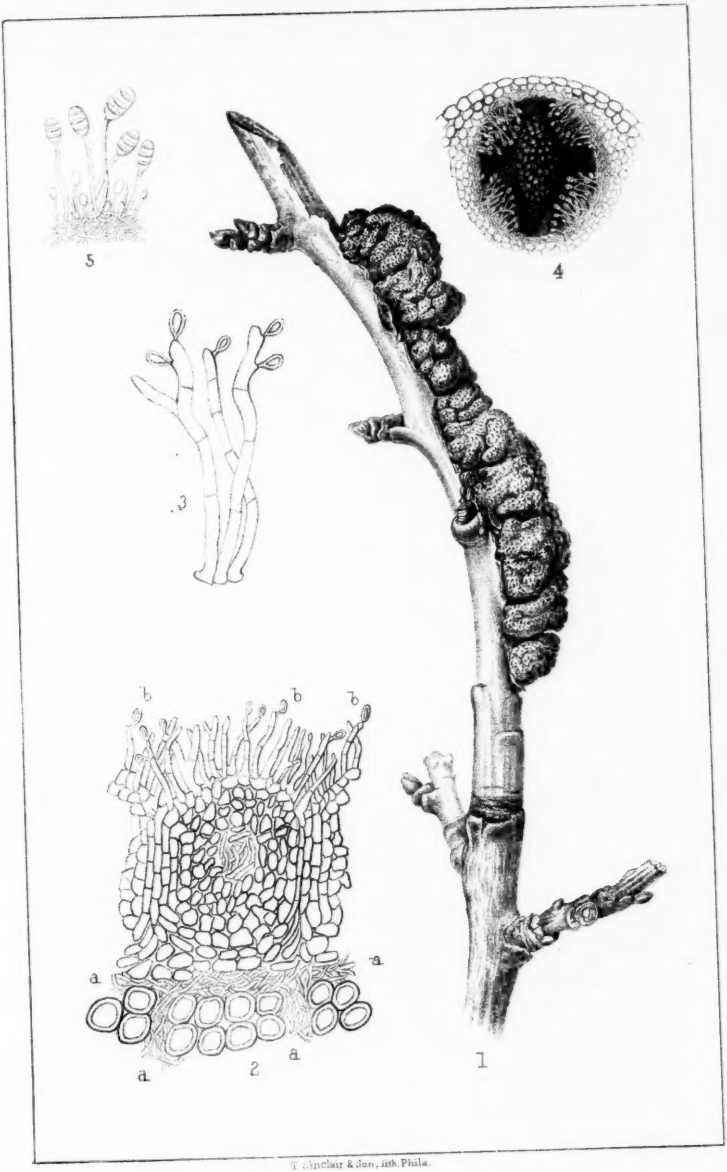

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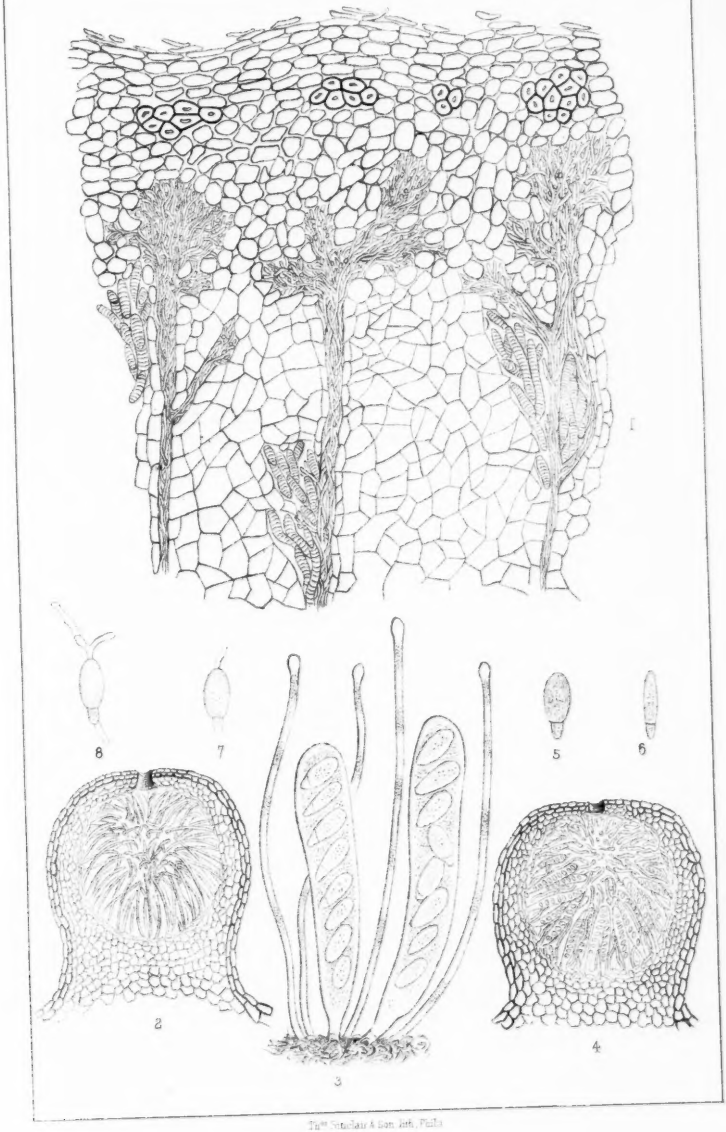

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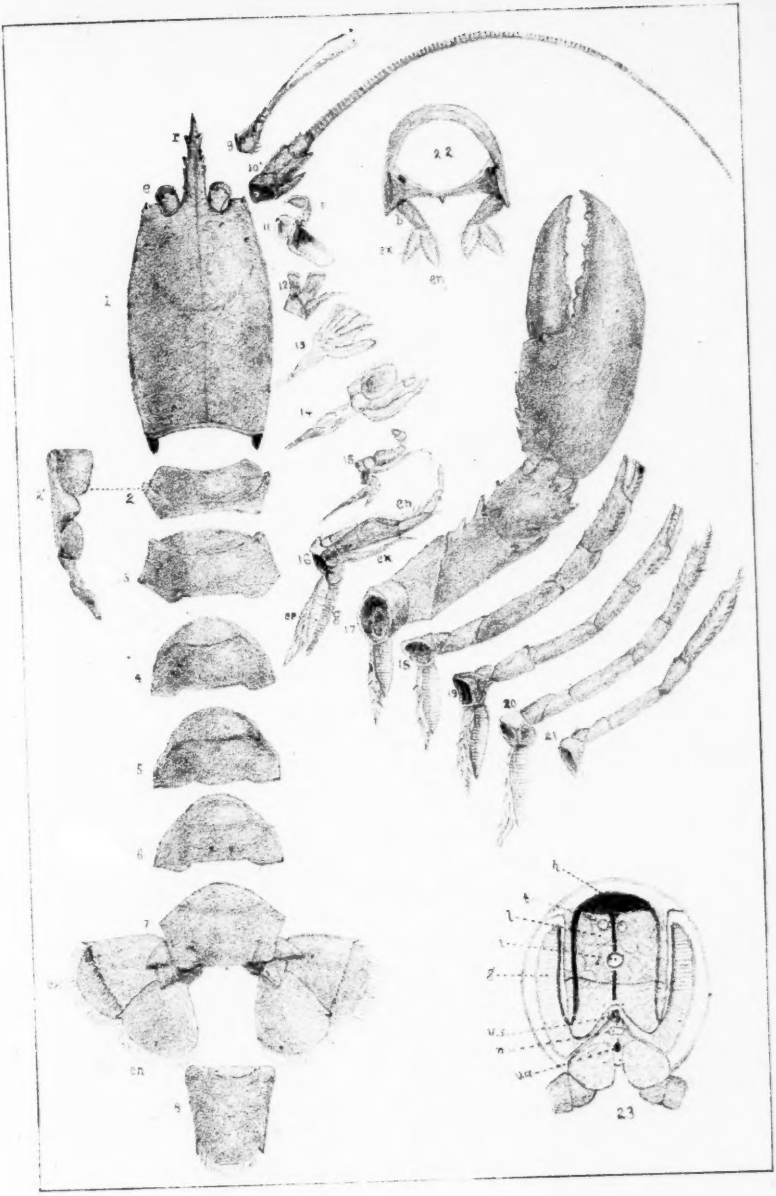

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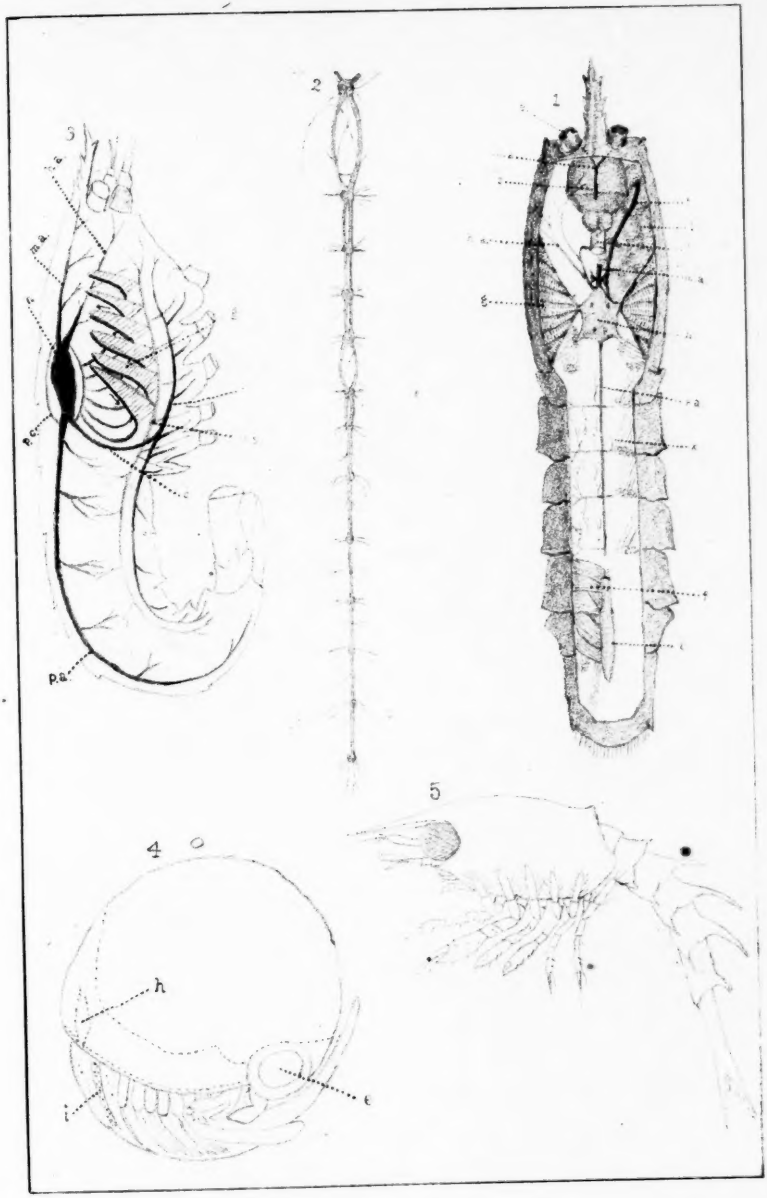

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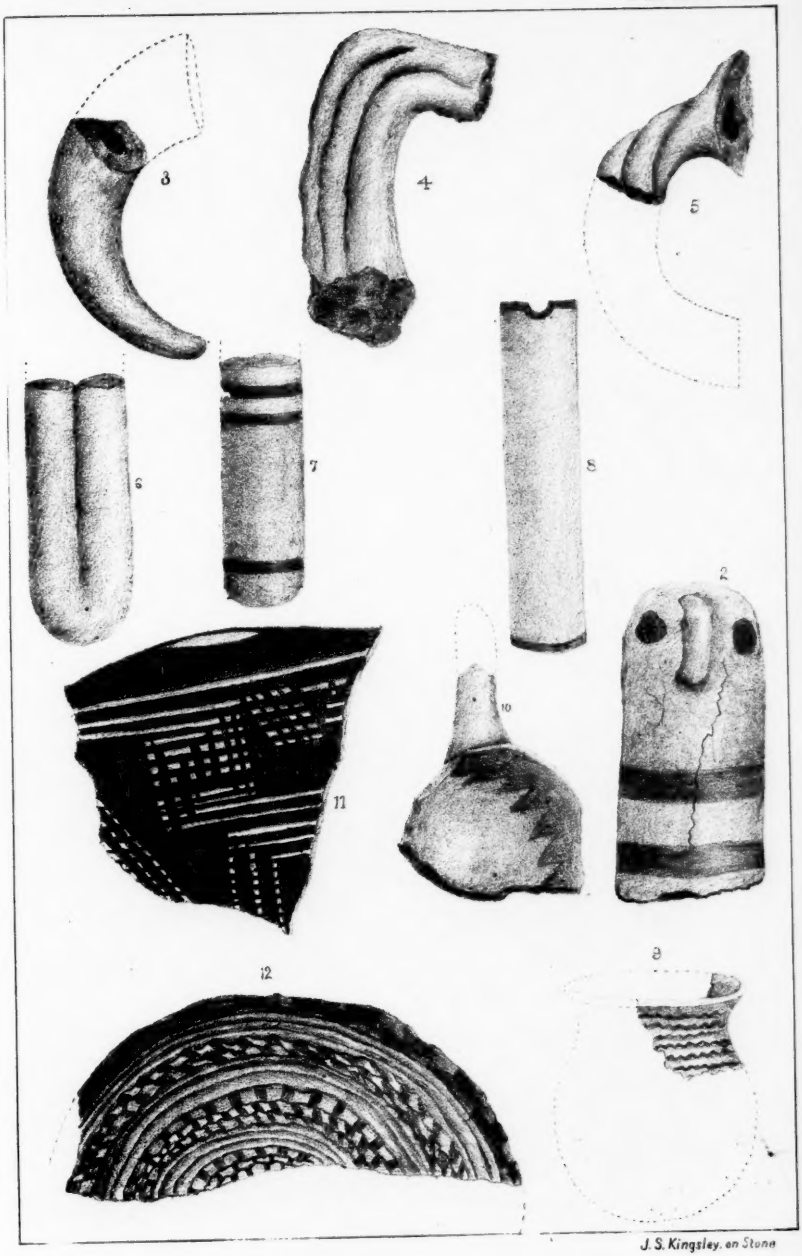

Ancient Pottery of Colorado. etc.